

**Project Innovation**

# **Health Innovation Development in Ho Chi Minh City**

**Final Report**

**Prepared for The Foreign, Commonwealth and Development Office  
and Ho Chi Minh City Department of Health**

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# Glossary

|              |                                                    |
|--------------|----------------------------------------------------|
| <b>AI</b>    | Artificial Intelligence                            |
| <b>AMR</b>   | Antimicrobial Resistance                           |
| <b>ARDS</b>  | Acute Respiratory Distress Syndrome                |
| <b>ASEAN</b> | Association of Southeast Asian Nations             |
| <b>BMA</b>   | British Medical Association                        |
| <b>BMJ</b>   | British Medical Journal                            |
| <b>BRC</b>   | Biomedical Research Centre                         |
| <b>CAGR</b>  | Compound Annual Growth Rate                        |
| <b>CDC</b>   | Centres for Disease Control and Prevention         |
| <b>CHI</b>   | Centre of Health Innovation                        |
| <b>COPD</b>  | Chronic Obstructive Pulmonary Disease              |
| <b>CPR</b>   | Cardiopulmonary Resuscitation                      |
| <b>DHCRC</b> | Digital Health Cooperative Research Centre         |
| <b>DHSC</b>  | Department of Health and Social Care               |
| <b>DOH</b>   | Department of Health                               |
| <b>EAU</b>   | European Urology Association                       |
| <b>ECMO</b>  | Extracorporeal Membrane Oxygenation                |
| <b>EHR</b>   | Electronic Health Record                           |
| <b>EIU</b>   | Economist Intelligence Unit                        |
| <b>EPSRC</b> | Engineering and Physical Sciences Research Council |
| <b>ETH</b>   | Swiss Federal Institute of Technology Zurich       |
| <b>FCDO</b>  | Foreign, Commonwealth and Development office       |
| <b>FHIR</b>  | Fast Healthcare Interoperability Resources         |
| <b>FPT</b>   | Financing and Promoting Technology Corporation     |
| <b>FT</b>    | Foundational Trusts                                |
| <b>FV</b>    | Franco-Vietnamese Hospital                         |
| <b>GBP</b>   | Great Britain Pound                                |
| <b>GCP</b>   | Good Clinical Practice                             |
| <b>GDP</b>   | Gross Domestic Product                             |
| <b>GDPR</b>  | General Data Protection Regulation                 |
| <b>GLP</b>   | Good Laboratory Practice                           |

|              |                                                    |
|--------------|----------------------------------------------------|
| <b>GMC</b>   | General Medical Council                            |
| <b>GP</b>    | General Practitioner                               |
| <b>GRDP</b>  | Gross Regional Domestic Product                    |
| <b>HCDC</b>  | Ho Chi Minh City Centre of Disease Control         |
| <b>HCMC</b>  | Ho Chi Minh City                                   |
| <b>HCP</b>   | Health Care Professional                           |
| <b>HIS</b>   | Hospital Information System                        |
| <b>HIV</b>   | Human Immunodeficiency Virus                       |
| <b>HL7</b>   | Health Level 7                                     |
| <b>HTD</b>   | Hospital for Tropical Diseases                     |
| <b>HUNA</b>  | HCMC Urology-Nephrology Association                |
| <b>IBM</b>   | International Business Machines Corporation        |
| <b>ICP</b>   | Integrated Care Provider                           |
| <b>ICU</b>   | Intensive Care Unit                                |
| <b>IP</b>    | Intellectual Property                              |
| <b>IT</b>    | Information Technology                             |
| <b>JV</b>    | Joint Venture                                      |
| <b>KHP</b>   | King's Health Partner                              |
| <b>LEAP</b>  | Leadership Engagement Acceleration and Partnership |
| <b>LIS</b>   | Laboratory Information System                      |
| <b>MIC</b>   | Ministry of Information and Communications         |
| <b>MOH</b>   | Ministry of Health                                 |
| <b>MOU</b>   | Memorandum of Understanding                        |
| <b>NCD</b>   | Non-Communicable Disease                           |
| <b>NDM</b>   | Nuffield Department of Medicine                    |
| <b>NENC</b>  | Northeast and North Cumbria                        |
| <b>NHG</b>   | National Healthcare Group                          |
| <b>NHS</b>   | National Health Service                            |
| <b>NHSE</b>  | National Health Service England                    |
| <b>NIA</b>   | National Innovation Agency                         |
| <b>NIHE</b>  | National Institute of Hygiene and Epidemiology     |
| <b>NIHR</b>  | National Institute for Health and Care Research    |
| <b>NNRCO</b> | Novo Nordisk Research Centre Oxford                |
| <b>NUS</b>   | National University of Singapore                   |



|                 |                                                            |
|-----------------|------------------------------------------------------------|
| <b>OSE</b>      | Oxford Science Enterprise                                  |
| <b>OUCRU</b>    | Oxford University Clinical Research Unit                   |
| <b>OUH</b>      | Oxford University Hospitals                                |
| <b>OUI</b>      | Oxford University Innovation                               |
| <b>PATH</b>     | Program for Appropriate Technology in Health               |
| <b>PFI</b>      | Private Finance Initiative                                 |
| <b>PGH</b>      | Phu Tho General Hospital                                   |
| <b>PHC</b>      | Primary Health Care                                        |
| <b>PHER</b>     | Partnership for Higher Education Reform                    |
| <b>PPP</b>      | Public Private Partnerships                                |
| <b>PSI</b>      | Pandemic Science Institute                                 |
| <b>RECOVERY</b> | Randomised Evaluation of COVID-19 Therapy                  |
| <b>SEA</b>      | Southeast Asia                                             |
| <b>SPV</b>      | Special Purpose Vehicle                                    |
| <b>STI</b>      | Sexually Transmitted Infection                             |
| <b>SWOT</b>     | Strengths, Weaknesses, Opportunities, and Threats Analysis |
| <b>TB</b>       | Tuberculosis                                               |
| <b>TRI</b>      | Translational Research Institute                           |
| <b>TTSH</b>     | Tan Tock Seng Hospital                                     |
| <b>UCL</b>      | University College London                                  |
| <b>UK</b>       | United Kingdom                                             |
| <b>UKRI</b>     | United Kingdom Research and Innovation                     |
| <b>USA</b>      | United States of America                                   |
| <b>USAID</b>    | United States Agency for International Development         |
| <b>USD</b>      | United States Dollar                                       |
| <b>VITAL</b>    | Vietnam ICU Translational Applications Laboratory          |
| <b>VNPT</b>     | Vietnam Posts and Telecommunications Group                 |
| <b>VNU</b>      | Vietnam National University, Ho Chi Minh City              |
| <b>VR</b>       | Virtual Reality                                            |
| <b>WHO</b>      | World Health Organization                                  |
| <b>YMID</b>     | Yothi Medical Innovation District                          |

# Executive Summary

## Project's Background

Vietnam is ranked 65th in the Global Health Security Index, and health outcomes have improved as living standards have risen. Infant mortality rates and life expectancy have both significantly improved since 1990, while 92% of the population is covered by the national health insurance scheme. However, non-communicable diseases such as cancer and diabetes now account for most deaths, and the ageing population will increase demand for healthcare services. Primary Health Care (PHC) will be key to meeting this demand, as it is cost-effective and can meet 80-90% of health demands. While the government has made efforts to improve public healthcare governance and expand private healthcare facilities, overcrowded public healthcare facilities in big cities remain a challenge. Vietnamese people also spend about US\$2 billion on overseas medical treatment each year.

Ho Chi Minh City (HCMC), the most populous city and a leading economic centre in Vietnam, has received significant support from the central government. The city administration is expected to meet specific demands with different priorities. HCMC's development agenda aims to become a health innovation centre in ASEAN by 2045 to serve the national population and neighbouring countries' patients. HCMC intends to set an example and make a profound impact on Vietnam's overall growth.

To become a regional health innovation hub, the HCMC Department of Health has identified seven areas of focus. These include (i) High-quality training for healthcare professionals; (ii) Developing modern infrastructure and deploying high-tech medical facilities; (iii) Providing a full range of quality healthcare services to serve diverse needs of the population; (iv) Building a network of care from primary health care to specialised medical care; (v) Developing specialised care techniques to deal with disease patterns; (vi) Promoting medical tourism and a combination of modern medicine and traditional medicine; (vii) Enhancing medical research, development, and innovation activities.

The UK, a global leader in health research and global health security, aims to use its expertise to ensure equitable access to health services. Bilateral relations between the UK and Vietnam have included cooperation on disease surveillance, medical training, digital health, and business links. In this context, the British Consulate General in HCMC and the HCMC Department of Health are exploring further support for HCMC to become a regional health innovation centre, with a proposed study to generate recommendations for a strategy and way forward.

## Project's Scope and Objectives of the study

KPMG and the Oxford University Clinical Research Unit (OUCRU) were commissioned to assist The British Consulate General in HCMC with the study for Health Innovation Development in HCMC. The study aims to i) conduct a comprehensive situational analysis and recommend an overall strategy, a roadmap/action plan including cost-effective options and resource requirements for HCMC to achieve its objective to become a health innovation centre in Southeast Asia and ii) recommend priority routes for the UK to cooperate with HCMC within the strategy.

The study will focus on two key areas: *High-quality training for healthcare professionals and Digitalisation application in specialized care techniques to address disease patterns and public health needs.*

- The structure of this report comprises of 4 main parts as follows:

### 1. Understanding Healthcare System in HCMC

This section provides current state analysis of HCMC's healthcare system with focus on medical trainings and digital infrastructure, and SWOT analysis.

## 2. Case studies from leading countries

The section is to identify good practices from other countries/cities in the world to become health innovation centres and key lessons learnt for HCMC. In this study, the shortlisted countries for benchmarking include: UK, Australia, South Korea, Thailand, and Singapore.

## 3. Strategy Roadmap for HCMC to develop its digital innovation centre

In order to form a strategy roadmap for HCMC to develop its digital innovation centre, KPMG and OUCRU have worked closely with The British Consulate General in HCMC, Department of Health in HCMC and relevant stakeholders to achieve the following key activities:

- Conducted interviews with Department of Health to clarify and understand their needs towards HCMC's healthcare service performance by 2030.
- Consolidate key insights from the secondary research and interviews with key stakeholders, including key hospitals and medical universities located in HCMC
- Conducted a visit of Vietnamese stakeholder delegation to the UK from 15 – 22 March 2024, as part of the study, to gather information from the UK side, test the emerging recommendations from the desk-based research and interviews, and establish contacts that would be needed to take those UK cooperation recommendations forward. Please refer to details of the UK trip in the Appendix section.

The strategy roadmap highlights the recommended action plan that includes cost-effective options and resource requirements for HCMC to achieve its objective to become a health innovation centre, spanning from short-term to long-term.

## 4. Priority Routes for the UK to cooperate with HCMC within the Strategy

The section is to propose the potential areas for UK stakeholders to cooperate with HCMC within the above strategy roadmap.

## Key research findings

### 1. Understanding Healthcare System in HCMC

As a high-quality healthcare centre in Vietnam, HCMC has shown continuous effort in improving the quality of medical services, protection, and care of people's health. Of which, medical trainings through international and domestic collaboration have been well-recognised with many positive outcomes and achievements in recent years. The city's international medical cooperation has involved collaborations amongst many leading hospitals and medical universities from key advanced countries, including the UK, the US, Germany, France, the Netherlands, Australia, Canada, China, South Korea, Taiwan, and amongst others.

In parallel with external medical training programs, HCMC hospitals have established in-house training centres that offer tailored training curricula to equip general and specialized doctors with advanced medical techniques. These in-house training programs are essential for training Vietnamese medical doctors following international standards.

Besides the city's focus on training high-quality human resources, foster international cooperation in education and research, HCMC is also proactively investing in digital health initiatives such as Health Information Technology, Technology Interventions, Telemedicine, and AI and Big Data. These initiatives, while still in their early stages and requiring enhanced momentum, lay the groundwork for HCMC's ultimate goal of improving healthcare services and establishing itself as a regional healthcare centre.

In a positive development, the issuance of Resolution No. 31/NQ/TW indicates HCMC's commitment to creating legal frameworks and encouraging FDI and domestic investment in digital health. The Resolution fosters improving healthcare quality, promoting digital health literacy, and awareness in the community.

Despite substantial investments in the healthcare system in HCMC, the city still faces challenges such as inadequate digital infrastructure, limited experienced healthcare and IT personnel, lack of funding, and low public awareness towards digital health. There is also a shortage of general doctors, especially high-quality doctors at primary care facilities, which hinders the development of healthcare human resources in HCMC.

A SWOT analysis highlights strengths, weaknesses, opportunities, and threats for the healthcare system in HCMC.



## 2. Case studies from leading countries

Enhancing the quality of medical human resource and accelerating healthcare digitalisation are at the essence of the selected countries' digital innovation hub. KPMG has selected five countries (the United Kingdom, Australia, South Korea, Singapore, Thailand) which either share similar economic and social characteristics to Vietnam or have proven success in establishing a digital innovation hub to benchmark against Vietnam. There are 6 key lessons from the analysis of the digital innovation hub model of these countries and has been categorised into 2 buckets which are Human resources development and Healthcare digitalisation as below:

### I/ Human resources development

**1. Strategic Action Plan for medical resource development and retainment:** Countries such as the United Kingdom and Thailand have enforced a Care and National Health Plan to set out specific strategies to elevate medical education and provide guidance to address national healthcare workforce barriers, including guidance on incentive schemes to retain medical workforce.

**2. Stakeholder collaboration:** All 5 countries have dedicated to improving medical training quality through domestic and international collaboration to establish globally accredited institutions for education and research. Singapore and Thailand have actively worked with leading international medical universities to attract investment in building campuses there.

**3. Financial assistance for medical students:** To encourage medical training and increase medical graduate supply, the Singaporean government has provided subsidies for medical students. In which, each medical undergraduate receives a subsidy of over USD 200,000 when pursuing a bachelor's degree in the medical field.

### III/ Healthcare digitalisation

**4. Data interoperability improvement:** All 5 selected countries have determined data interoperability as the top prioritized barrier to address to establish a digital innovation hub. To improve data interoperability, countries have invested in improving their national EHR system and upgrading them to meet with international data interoperability standard such as HL7.

**5. Public awareness and readiness improvement:** Public trust is critical for a successful roll-out of digital health initiatives, and thus, 5 selected countries have actively organised workshops, awareness programmes and promoted the usage of telehealth service to make the services more common and accessible to the public community.

**6. Digital health ecosystem:** The United Kingdom has established an ecosystem to bring scientific research into clinical treatments. Collaboration between academia, industry, and government agencies, followed by sufficient investment in R&D, and public and patient engagement, is key to the development process.

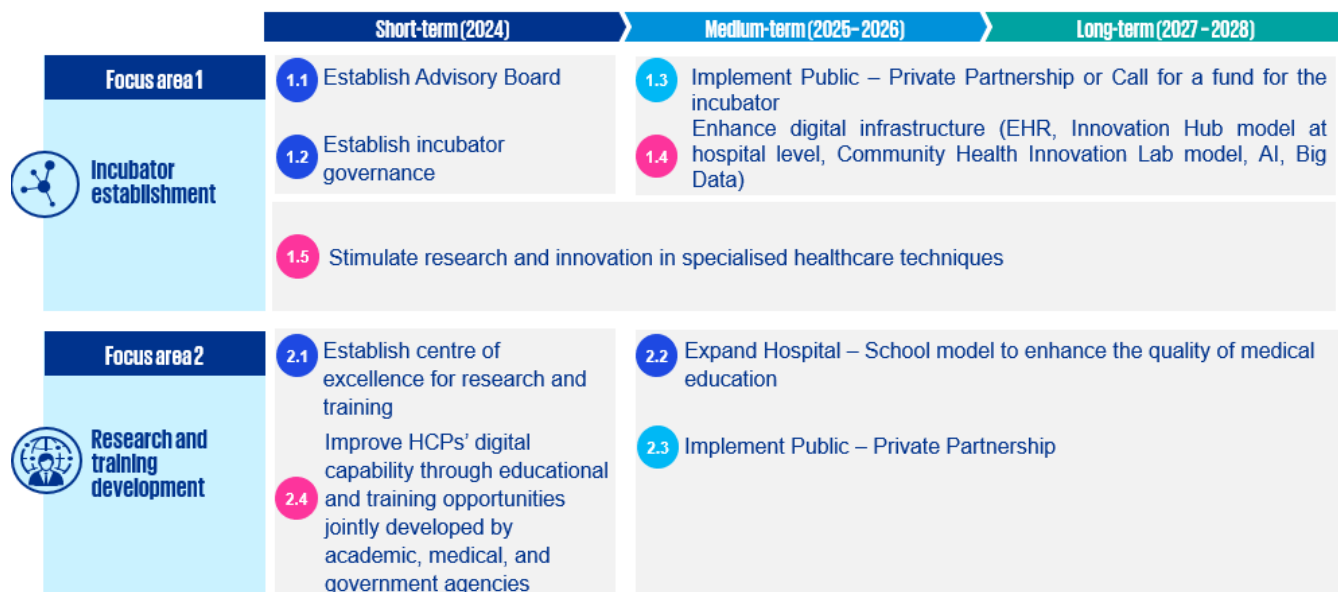
### 3. Strategy Roadmap for HCMC to become a digital innovation centre and Priority Routes for HCMC to cooperate with UK stakeholders

With an aging population in Vietnam, the demand for healthcare is expected to significantly increase along with the prevalence of chronic illnesses among older age groups, resulting in rising healthcare costs and further burdening the already overfilled public healthcare facilities. To address this issue, the DOH aims to transform HCMC into a regional health innovation hub, leveraging its status as the country's largest population centre and a leading economic hub. The DOH of HCMC has developed four core objectives towards becoming an ASEAN digital health centre, supported by seven key fields including:

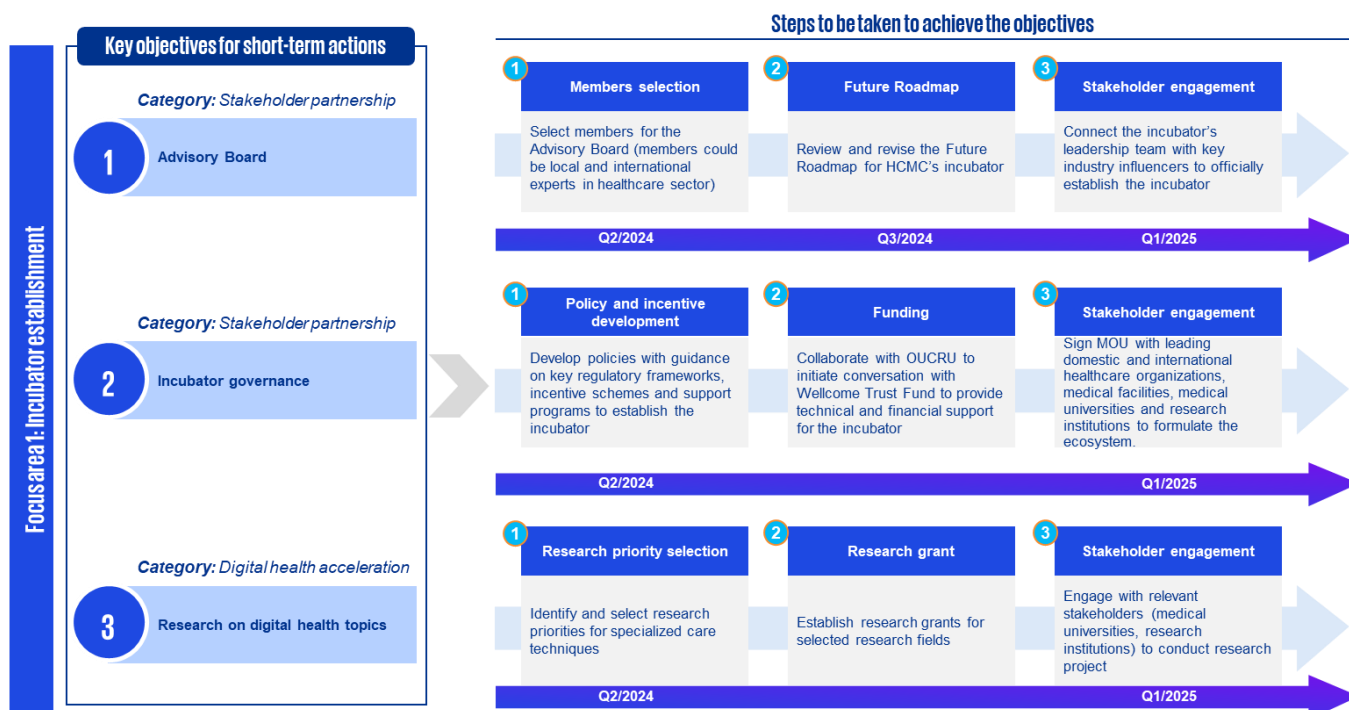
1. High-quality training for healthcare professionals
2. Developing modern infrastructure and deploying high-tech medical facilities
3. Providing a full range of quality healthcare services to serve diverse needs of population
4. Building a network of care from primary healthcare to specialised medical care
5. Developing specialised care techniques to deal with disease patterns
6. Promoting medical tourism and a combination of modern medicine and traditional medicine
7. Enhancing medical research, development and innovation activities

Following that, the Strategy Roadmap developed by KPMG and OUCRU proposes 2 focus areas for HCMC: **1) Incubator establishment and 2) Research and training development**. For each of the focus areas, there are 3 key categories for HCMC to concentrate on: *1) Stakeholder partnership; 2) Funding and 3) Digital health acceleration*.

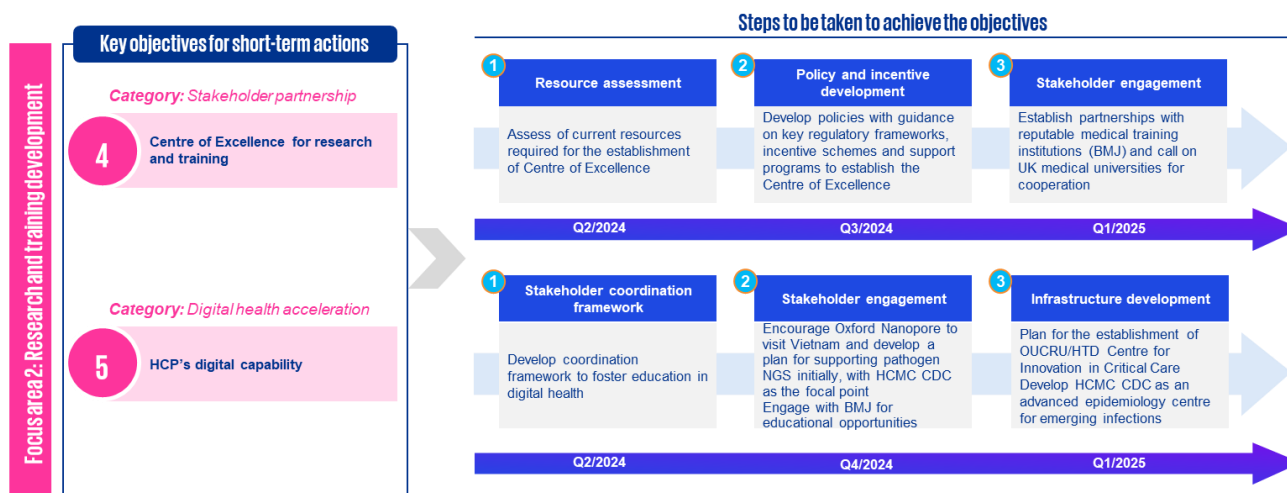
## Strategy Roadmap for Ho Chi Minh City's healthcare Innovation centre will focus on 3 key categories



To layout the foundation for the digital innovation centre, **in the next 12 months**, HCMC needs to take the following actions:







For the first focus area – **Incubator establishment**, the table below will specify the detailed actions that needed to be taken and initiatives that needed to be done through UK’s collaboration:

### To fully utilise digital healthcare, stakeholders should take action to foster the establishment of a Health Innovation Incubator

We call on all stakeholders, especially government bodies to take lead in establishing an incubator to promote R&D initiatives in the digital health sector. Accordingly, we recommend the following actions for the government bodies and other relevant stakeholders to contribute to the development of the incubator in the next 5 years:

|                      |                         | Action items                                                                                                                                                                                                                                       | Stakeholder involved                                 | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator establishment | • Establish Advisory Board                                                                                                                                                                                                                         |                                                      |      |      |      |      |      |
|                      |                         | Select local and international experts to be a part of the Advisory Board for the incubator                                                                                                                                                        | • Government bodies<br>• FCDO<br>• OUCRU<br>• KPMG   |      |      |      |      |      |
|                      |                         | Review, revise the report's plan with the Advisory Board and DOH                                                                                                                                                                                   | • Incubator Advisory Board<br>• Department of Health |      |      |      |      |      |
|                      |                         | Review and provide strategic advisory for the future roadmap of the incubator                                                                                                                                                                      | • Incubator Advisory Board                           |      |      |      |      |      |
|                      |                         | Provide guidance, connecting the incubator's leadership team with key industry influencers                                                                                                                                                         | • Incubator Advisory Board                           |      |      |      |      |      |
|                      |                         | • Establish incubator governance                                                                                                                                                                                                                   |                                                      |      |      |      |      |      |
|                      |                         | Develop a policy roadmap with guidance on key regulatory frameworks, incentive schemes and support programs to establish the incubator in HCMC                                                                                                     | • Government bodies                                  |      |      |      |      |      |
|                      |                         | Provide financial assistance in the form of funding incentives, tax incentives and grant programs for medical facilities, medical universities and digital health solution providers to push the acceleration of R&D progress within the incubator | • Government bodies                                  |      |      |      |      |      |
|                      |                         | Collaborate with OUCRU to leverage OUCRU's existing relationship with the Wellcome Organisation to initiate conversation about technical and financial support for the establishment of the incubator                                              | • Government bodies<br>• OUCRU<br>• Wellcome Trust   |      |      |      |      |      |
|                      |                         | Sign MOU with leading international organizations to foster the technology transfer and to facilitate international experience exchange in the topic of digital health                                                                             | • Government bodies                                  |      |      |      |      |      |
|                      |                         | Promote both domestic and international partnership, bringing together medical facilities, academia, industry players to share expertise, enhance commercialisation opportunities and prompt technology transfer                                   | • Government bodies                                  |      |      |      |      |      |
|                      |                         | Collaborate with digital health start-ups to conduct research                                                                                                                                                                                      | • Medical universities and research institutions     |      |      |      |      |      |
|                      |                         | Cooperate with data start-ups to improve data standard                                                                                                                                                                                             | • Medical facilities                                 |      |      |      |      |      |

In pink: Collaborate with UK stakeholders

|                      |                         | Action items                                                                                                                                                                                   | Stakeholder involved                   | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator establishment | Support health tech companies in piloting their products and giving advices to make the products become more tailored to patient's needs.                                                      | • Medical facilities                   |      |      |      |      |      |
|                      |                         | Cooperate with medical universities and medical facilities in joint research projects for digital health application                                                                           | • Industry players/ start-up companies |      |      |      |      |      |
|                      |                         | Provide funding by investing in the HCMC health innovation incubator                                                                                                                           | • Private funds                        |      |      |      |      |      |
|                      |                         | • Implement Public – Private Partnership or Develop a fund for the incubator                                                                                                                   |                                        |      |      |      |      |      |
|                      |                         | Integrated Public – Private Partnership                                                                                                                                                        | • Government bodies                    |      |      |      |      |      |
|                      |                         | Allocate government funds in conjunction with the funding from the private sector for the incubator                                                                                            | • Government bodies                    |      |      |      |      |      |
|                      |                         | Actively engage with potential private investors such as Wellcome Trust to seek for suitable private investors                                                                                 | • Government bodies                    |      |      |      |      |      |
|                      |                         | Consider offering tax incentives or financial support to encourage private sector's participation in the PPP                                                                                   | • Government bodies                    |      |      |      |      |      |
|                      |                         | Facilitate the negotiation and establishment of partnership agreements between public and private stakeholders involved in the PPP.                                                            | • Government bodies                    |      |      |      |      |      |
|                      |                         | Provide financial investment to support the establishment and operations of the incubator                                                                                                      | • Private sector                       |      |      |      |      |      |
|                      |                         | Provide assistance for the incubator in areas including business development, marketing and IP protection.                                                                                     | • Private sector                       |      |      |      |      |      |
|                      |                         | Establish strategic partnerships or collaborations with start-ups within the incubator to co-create products or leverage their combined resources to explore new digital health opportunities. | • Private sector                       |      |      |      |      |      |
|                      |                         | Connect start-ups with potential customers, partners, investors and suppliers                                                                                                                  | • Private sector                       |      |      |      |      |      |

In pink: Collaborate with UK stakeholders

|                      |                         | Action items                                                                                                                                                                                                              | Stakeholder involved          | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator establishment | Or Funding from private resources                                                                                                                                                                                         |                               |      |      |      |      |      |
|                      |                         | Call for funding from venture capitalists or angel investors or private funds                                                                                                                                             | • Incubator's management team |      |      |      |      |      |
|                      |                         | Engage with relevant professional associations that connect entrepreneurs with investors to attract potential venture capitalists and angel investors.                                                                    | • Incubator's management team |      |      |      |      |      |
|                      |                         | Develop suitable marketing strategies by preparing pitch decks that highlight detailed business plan, ROI potential to attract potential investors.                                                                       | • Incubator's management team |      |      |      |      |      |
|                      |                         | Consider providing attractive investor incentives, such as preferential access to deal flow, opportunities to participate in follow-on funding rounds and exclusive access to innovation within the incubator's ecosystem | • Incubator's management team |      |      |      |      |      |

|                      |                         | Action items                                                                                                                                                                               | Stakeholder involved                                                 | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator Establishment | • Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)                                                        |                                                                      |      |      |      |      |      |
|                      |                         | Establish a platform for seamless exchange of patient information (for Health information technology – EHRs)                                                                               |                                                                      |      |      |      |      |      |
|                      |                         | Government agencies in HCMC to collaborate with the Ministry of Information and Communication to provide regulatory guidance and support                                                   | • Ministry of Information and Communication<br>• Government agencies |      |      |      |      |      |
|                      |                         | Establish a platform to gather patients information collected at hospitals to ensure seamless exchange of data across different facilities                                                 | • Medical facilities                                                 |      |      |      |      |      |
|                      |                         | Design and develop the platform according to industry standards                                                                                                                            | • Technology firms                                                   |      |      |      |      |      |
|                      |                         | Organize awareness programs to promote the usage of EHR in local public                                                                                                                    | • Government agencies                                                |      |      |      |      |      |
|                      |                         | Consider integrating EHRs with telemedicine once the EHR system is completed to allow efficient data transmission                                                                          |                                                                      |      |      |      |      |      |
|                      |                         | Implement integration protocols and provide training to staff                                                                                                                              | • Medical facilities                                                 |      |      |      |      |      |
|                      |                         | Develop interfaces for seamless data exchange and ensure interoperability between EHR and telemedicine systems                                                                             | • Technology firms                                                   |      |      |      |      |      |
|                      |                         | Piloting "Innovation Hub" model and "Community Health Innovation Lab" model                                                                                                                |                                                                      |      |      |      |      |      |
|                      |                         | Encourage affiliated hospitals to research and pilot the "Innovation hub" model of Alder Hey Children's Hospital, Liverpool                                                                | • Department of Health<br>• Medical facilities                       |      |      |      |      |      |
|                      |                         | Encourage Children's Hospital 1 to proactively connect online with Alder Hey Hospital to study and learn more about the innovation unit model within the hospital for pilot implementation | • Department of Health<br>• Medical facilities                       |      |      |      |      |      |
|                      |                         | Through the UK Consulate General in Ho Chi Minh City, the DoH continues to connect, research and learn the model of "Community Health Innovation Lab" (Civic Health Innovation Lab-CHIL)   | • Department of Health<br>• UK Consulate General                     |      |      |      |      |      |
|                      |                         | Follow-up discussions with ASEAN Business Council to explore how they can support DOH (in Q3 – Q4 2024)                                                                                    | • Department of Health<br>• ASEAN Business Council                   |      |      |      |      |      |
|                      |                         | Discuss with Astra Zeneca about the innovation centre (in Q4 2024)                                                                                                                         | • Department of Health<br>• Astra Zeneca                             |      |      |      |      |      |

In pink: Collaborate with UK stakeholders



|                      |                          | Action items                                                                                                                                                                              | Stakeholder involved                | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator Establish ment | • Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)                                                       |                                     |      |      |      |      |      |
|                      |                          | AI & Big data implication                                                                                                                                                                 |                                     |      |      |      |      |      |
|                      |                          | Invest in infrastructure, specifically allocating resources to procure and implement hardware and software for data storage, processing, and analysis                                     |                                     |      |      |      |      |      |
|                      |                          | Offer funding and regulatory support for infrastructure development                                                                                                                       | • Government agencies               |      |      |      |      |      |
|                      |                          | Identify data analytics requirements and potential use cases                                                                                                                              | • Medical facilities                |      |      |      |      |      |
|                      |                          | Provide AI and Big Data solutions tailored to healthcare needs                                                                                                                            | • Technology firms                  |      |      |      |      |      |
|                      |                          | Promote data sharing and cooperation by establishing frameworks for data sharing and collaboration among healthcare providers to leverage collective insights for research and innovation | Government aTechnology firmsgencies |      |      |      |      |      |
|                      |                          | Should facilitate policy development and funding for collaborative initiatives                                                                                                            | • Government agencies               |      |      |      |      |      |
|                      |                          | Contribute anonymised data and expertise for collaborative projects                                                                                                                       | • Medical facilities                |      |      |      |      |      |
|                      |                          | Conduct joint studies and analyses to extract actionable insights                                                                                                                         | • Research insitutions              |      |      |      |      |      |

|                      |                          | Action items                                                                                                                                                                                                                                     | Stakeholder involved                                                                     | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------|------|------|------|------|
| Strategic Activities | Incubator Establish ment | • Stimulate research and innovation in specialised healthcare techniques                                                                                                                                                                         |                                                                                          |      |      |      |      |      |
|                      |                          | Establish research grants for specialised healthcare techniques                                                                                                                                                                                  |                                                                                          |      |      |      |      |      |
|                      |                          | Government Health Agencies including Department of Health and Department of Education are recommended to provide budget, oversight and support the grant program                                                                                 | • Government Health Agencies<br>• Department of Health<br>• Department of Education      |      |      |      |      |      |
|                      |                          | Contribute expertise, infrastructure and personnel for research projects                                                                                                                                                                         | • Local University<br>• Research institutions                                            |      |      |      |      |      |
|                      |                          | Identify research priorities, provide clinical insights and participate in collaborative research efforts                                                                                                                                        | • Healthcare facilities<br>• Practitioners Institutions                                  |      |      |      |      |      |
|                      |                          | Create platforms and networks for knowledge exchange and collaboration in specialized healthcare techniques. Develop online portals, forums, and conferences to facilitate information sharing, networking, and collaboration among stakeholders |                                                                                          |      |      |      |      |      |
|                      |                          | Support and facilitate knowledge exchange initiatives, promote collaboration, and address regulatory considerations                                                                                                                              | • Government Health Agencies including Department of Health<br>• Department of Education |      |      |      |      |      |
|                      |                          | Contribute research expertise, educational resources, and collaborative opportunities for knowledge exchange                                                                                                                                     | • Academic institutions                                                                  |      |      |      |      |      |
|                      |                          | Share insights, research findings, and best practices in specialized healthcare techniques                                                                                                                                                       | • Healthcare professionals and researchers                                               |      |      |      |      |      |

For the second focus area – **Research and training development**, a detailed action plan is provided as below for HCMC. This table also highlighted areas that HCMC can collaborate with UK stakeholders to accelerate the implementation of the recommendation:

### In addition, improvement in research and medical education quality is essential to support the development of HCMC digital innovation centre

We call on all stakeholders, especially medical universities to take lead in continuously elevate the current quality of medical education in HCMC to provide sufficient talent pool to serve the establishment of the digital innovation centre. Accordingly, we recommend the following actions for the government bodies and other relevant stakeholders to implement in the next 5 years:

|                      |                                     | Action items                                                                                                                                                                                                                                                                                                                                  | Stakeholder involved                                              | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------|------|------|------|------|
| Strategic Activities | Research and training develop- ment | • Establish Centre of Excellence for research and training                                                                                                                                                                                                                                                                                    |                                                                   |      |      |      |      |      |
|                      |                                     | Appoint an interdisciplinary committee charged with envisioning the prospective centre of excellence, determining mission and vision statements, and the scope of work and the overall strategies of the centre's developments                                                                                                                | • Government Health Agencies                                      |      |      |      |      |      |
|                      |                                     | Assess the availability of foundational requirements for success by verifying the sufficiency of financial resources, organisational culture, and leadership support                                                                                                                                                                          | • Government Health Agencies                                      |      |      |      |      |      |
|                      |                                     | Establish partnerships with reputable medical training institutions, including domestic and international institutions with a proven track record in medical training                                                                                                                                                                         | • Government Health Agencies                                      |      |      |      |      |      |
|                      |                                     | DOH may propose to the City People's Committee (through the Investment and Trade Promotion Center (ITPC)) to call on UK medical universities to cooperate with the city's medical universities to support high-quality human resource training for the city and develop a medical training curriculum that meets with international standards | • Department of Health<br>• the City People's Committee<br>• ITPC |      |      |      |      |      |
|                      |                                     | Establish partnership with reputable medical training institutions (BMJ) and call on UK medical universities for cooperation                                                                                                                                                                                                                  |                                                                   |      |      |      |      |      |
|                      |                                     | Establish partnerships with reputable medical training institutions, including domestic and international institutions with a proven track record in medical training                                                                                                                                                                         | • Hospitals<br>• Medical universities                             |      |      |      |      |      |
|                      |                                     | Strengthen collaboration policies between health science universities and practicing hospitals, with an emphasis on improving the quality of practical medical training at basic and specialised healthcare levels                                                                                                                            | • Hospitals<br>• Medical universities                             |      |      |      |      |      |
|                      |                                     | Construct a recruitment plan to attract highly skilled individuals and how to retain them                                                                                                                                                                                                                                                     | • Hospitals<br>• Medical universities                             |      |      |      |      |      |
|                      |                                     | Provide in-depth advice on how HCMC can build a centre of excellence, including incorporating essential foundations such as implementation support, continuous quality improvement for identified interventions                                                                                                                               | • Internationally reputable healthcare institutions               |      |      |      |      |      |

In pink: Collaborate with UK stakeholders

|                      |                                   | Action items                                                                                                                                                                                                                                             | Stakeholder involved                       | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|------|------|------|------|
| Strategic Activities | Research and training development | • Expand Hospital – School model to enhance the quality of medical education                                                                                                                                                                             |                                            |      |      |      |      |      |
|                      |                                   | Develop a guideline to instruct existing medical universities on expanding the current Hospital – School Model.                                                                                                                                          | • Government bodies                        |      |      |      |      |      |
|                      |                                   | Create and develop policy incentives for the developer of the hospital in the Hospital – School Model                                                                                                                                                    | • Government bodies                        |      |      |      |      |      |
|                      |                                   | Develop strategic plan on accelerating the current Hospital – School model                                                                                                                                                                               | • Medical universities                     |      |      |      |      |      |
|                      |                                   | Identify areas for collaboration and exchange between the university and the hospital for current medical lecturers and staff.                                                                                                                           | • Medical universities                     |      |      |      |      |      |
|                      |                                   | Develop attractive compensation and benefit program to attract and retain talents.                                                                                                                                                                       | • Medical facilities                       |      |      |      |      |      |
|                      |                                   | Make investment into the construction of hospitals and become the developer. Investment can be done in the form of: Public – Private Partnership or Build – Operate – Transfer.                                                                          | • Private investors                        |      |      |      |      |      |
|                      |                                   | • Implement Public-Private Partnership                                                                                                                                                                                                                   |                                            |      |      |      |      |      |
|                      |                                   | Identify appropriate and credible partners and engage with them in terms of their capacity to implement, whether they have sufficient resources, do they have the authority to secure approvals quickly and expeditiously                                | • Government bodies and medical facilities |      |      |      |      |      |
|                      |                                   | Negotiate a decision-making structure that will preserve trust and credibility as the partnership evolves, which features clear methods for arriving at decisions and clear protocols for resolving disagreements.                                       | • Government bodies and medical facilities |      |      |      |      |      |
|                      |                                   | Ensure adequate and sustainable financing for PPP to ensure that there is enough investment in technology, infrastructure, and human resources required for the partnership's success                                                                    | • Government bodies and medical facilities |      |      |      |      |      |
|                      |                                   | Establish monitoring and evaluation mechanisms to measure performance, track progress and identify areas for improvement.                                                                                                                                | • Government bodies and medical facilities |      |      |      |      |      |
|                      |                                   | Foster communication with the public sector to better understand the objectives, expectations, challenges, and outcomes of the PPP                                                                                                                       | • Private sector's partners                |      |      |      |      |      |
|                      |                                   | Identify key enablers that can influence the success of PPP and the potential risks and challenges encountered                                                                                                                                           | • Private sector's partners                |      |      |      |      |      |
|                      |                                   | Co-develop with the public sector robust project management and governance structures to establish clear roles and responsibilities, efficient communication protocols, optimal distribution of risks and incentives, and dispute resolution mechanisms. | • Private sector's partners                |      |      |      |      |      |
|                      |                                   | Ensure the PPPs are economically viable and create mutual benefits, stimulate innovation and establish a sustainable relationship between both parties.                                                                                                  | • Private sector's partners                |      |      |      |      |      |

|                      |                                   | Action items                                                                                                                                                                                                        | Stakeholder involved                                | 2024 | 2025 | 2026 | 2027 | 2028 |
|----------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|------|
| Strategic Activities | Research and training development | • Improve HCPs' digital capability through educational and training opportunities jointly developed by academic, medical, and government agencies                                                                   |                                                     |      |      |      |      |      |
|                      |                                   | Take lead with an overarching and human-centric digital health strategy, including a framework for coordination among all the decision-making actors                                                                | • Government bodies                                 |      |      |      |      |      |
|                      |                                   | Advance evaluation of and regulatory safeguard for digital technologies                                                                                                                                             | • Government bodies                                 |      |      |      |      |      |
|                      |                                   | Promote user-friendliness to avoid technology getting in the way of work                                                                                                                                            | • Government bodies                                 |      |      |      |      |      |
|                      |                                   | Encourage Oxford Nanopore to visit Vietnam and develop a plan for supporting pathogen NGS initially, with HCMC CDC as the focal point.                                                                              | • Government bodies<br>• Oxford Nanopore            |      |      |      |      |      |
|                      |                                   | Engage with BMJ for educational opportunities                                                                                                                                                                       | • Government bodies                                 |      |      |      |      |      |
|                      |                                   | Plan for the establishment of OUCRU/HTD Centre of Innovation in Critical care                                                                                                                                       | • Government bodies<br>• BMJ                        |      |      |      |      |      |
|                      |                                   | Develop HCMC CDC as an advanced epidemiology centre for emerging infections, with assistance from Oxford Nanopore Technology and OUCRU                                                                              | • Government bodies<br>• OUCRU<br>• Oxford Nanopore |      |      |      |      |      |
|                      |                                   | Incorporate digital skills in the core content of health education and training and merging the high-tech with the high-touch skills                                                                                | • Medical universities and facilities               |      |      |      |      |      |
|                      |                                   | Drive collaboration efforts to bring together experts from different disciplines to transform healthcare practice                                                                                                   | • Medical universities and facilities               |      |      |      |      |      |
|                      |                                   | Engage with industry partners and adjacent industries like engineering and computer science to promote technology transfer, co-creation and joint venture partnerships                                              | • Medical universities and facilities               |      |      |      |      |      |
|                      |                                   | Develop collaborative ventures with academic institutions and government agencies on digital health innovation to co-create practical solutions and provide a platform for knowledge sharing and thought leadership | • Private companies                                 |      |      |      |      |      |
|                      |                                   | Offer fundings to stimulate the developments of infrastructure and resources necessary to execute the training programmes                                                                                           | • Private companies                                 |      |      |      |      |      |

In pink: Collaborate with UK stakeholders

# 1. Understanding Healthcare System in HCMC

## 1.1. An overview of Vietnam's healthcare system

The current journey to become a doctor in Vietnam requires an average commitment of 7.5 years, consisting of six years of academic studies and an additional 18 months of practical training in hospitals, followed by two postgraduate pathways, which are research and teaching, or becoming practitioners.

There are 33 institutions in total that provide medical training in Vietnam, with 22 public institutions and 11 private schools. The Northern Region contributes 14 institutions to the total count, while the Southern Region is emerging as a vital region with 13 institutions. The Central Region has five universities to provide training for local students. Noticeably, the Hospital – University model is being replicated across regions, offering valuable hands-on training to medical students in about 20 universities.

The total number of doctor intakes in Vietnam increased from 9,180 in 2019 to 17,467 in 2023, consisting of general and specialised doctors. Both general and specialised doctor intakes displayed consistent growth, with a total of 42,586 general doctors and 31,486 specialised doctors over the span of five years. The Northern Region showed positive growth with a total of 34,028 doctors in training, while the Southern Region also reflected a growing intake with 34,582 doctors. Meanwhile, the Central Region exhibited steady growth, with 5,462 doctor intakes in total.

The ratio of doctors per 1,000 people increased from 0.87 in 2019 to 0.93 in 2023, reflecting an improvement in Vietnam's ability to provide medical services to the growing population. However, when compared to other Asian countries such as Thailand, Singapore, and Malaysia, the number of doctors per 1,000 of the population in Vietnam is relatively below the average of 1.98.

Vietnam's drive for digital transformation has spurred efforts to advance the healthcare sector, bolstered by four key digital health initiatives: Health Information Technology, Technology Interventions, AI and Big Data, and Telemedicine. Of these, Technology Interventions and Telemedicine are seeing the most significant progress, leaving room for the development of Health Information Technology, and AI and Big Data.

### 1.1.1. Medical Trainings for general practitioners and specialised doctors in Vietnam

Medical practitioners undergo a demanding and extensive period of study and research, accompanied by a substantial volume of knowledge. Presently, in Vietnam's educational curriculum, the journey to becoming a physician requires an average commitment of 7.5 years: six years of academic studies and an additional 18 months of practical training in hospitals (1, Article 24, Law on Medical examination and Treatment, the Vietnamese National Assembly, 2009), culminating in the issuance of a professional certification.

The postgraduate medical education system can be classified into two directions.

#### **I/ Research and teaching**

The first direction is where individuals pursue Master's in Medicine programs following the foundation six-year medical curriculum. This pathway aims to equip individuals with the skills needed for roles in research, teaching and knowledge contribution within their chosen medical specialisations.

#### **II/ Practitioner**

The second direction emphasises practical application, guiding graduates to become practicing doctors in healthcare facilities. This includes progressing to become specialised doctors, starting with level-I specialisation, level-II specialisation and resident doctor.

a/ Level-I specialisation: these individuals would achieve a high level of expertise in a specific medical field. To acquire a level-I specialisation, the student must complete six years of medical education (undergraduate), 18 months of practical experiences at healthcare facilities, additional 2 years of specialisation and successfully defence a specialised thesis for the conferment of the Level-I specialisation degree. These specialists can address diseases related to their area of expertise, such as internal medicine, surgery, paediatrics, dermatology, neurology, etc.

b/ Level-II specialisation: to attain the Level-II specialisation, an applicant must meet certain conditions, including having prior Level-I specialisation degree or a Master's degree in the relevant field with a minimum of 36 months of professional experience post Master's, along with a certification in medical practice (applicable to fields requiring specific certifications).

c/ Resident doctor:

In addition to the above programmes, graduates of general medicine also undergo a competitive examination for resident doctors, a rigorous selection process for the best talents in the medical field. The regulations governing the training of resident doctors, outlined in Decision 19/2006/QĐ-BYT, specify eligibility criteria such as a relevant undergraduate degree with a minimum of a “Distinction” grade, disciplinary record during undergraduate years, age not exceeding 27 and meeting health requirements for long-term commitment in the curriculum and services in the healthcare sector. Successful graduates are awarded the title of Resident Doctor, Specialised Doctor - Level I, and are recommended for a Master's degree with the Ministry of Education.

#### **Number of universities that offer comprehensive training program for general and specialised doctors (including dentistry, traditional medicine and preventive healthcare) in Vietnam in 2023**

| Regions                    | By Sector |           | Total     |
|----------------------------|-----------|-----------|-----------|
|                            | Public    | Private   |           |
| <b>The Northern Region</b> | 11        | 3         | 14        |
| <b>The Central Region</b>  | 3         | 2         | 5         |
| <b>The Southern Region</b> | 7         | 6         | 13        |
| <b>Grand total</b>         | <b>22</b> | <b>11</b> | <b>33</b> |

*Source: KPMG's research and analysis*

In total, there are 33 institutions that provide medical training in Vietnam, of which 8 belong to the Ministry of Health (namely: Hanoi Medical University, Thai Binh University of Medicine and Pharmacy, Hai Duong Medical Technical University, Vietnam University of Traditional Medicine, Hai Phong University of Medicine and Pharmacy, Da Nang University of Medical Technology and Pharmacy, Ho Chi Minh City University of Medicine and Pharmacy, and Can Tho University of Medicine and Pharmacy), while the rest belong to the Ministry of Education. The Northern Region emerges as a key region, contributing 15 institutions to the total count, with the majority reputable institutions mainly located in Hai Duong, Hai Phong, Thai Binh, and especially Hanoi. The southern region is also a vital region in Vietnam, with 12 institutions, and it stands out as a hub for medical education. Ho Chi Minh City, as the economic hub in

this region, contributes six institutions, three of which have been pioneering in medical education in the region (Ho Chi Minh University of Medicine and Pharmacy, Pham Ngoc Thach University of Medicine, and Vietnam National University HCMC - School of Medicine), which showcases a targeted and strategic approach to being a centre of medical training. The Central Region, on the other hand, has a smaller number of universities to provide training for local students with less rigorous admission standards. Hue and Da Nang are the two key cities in this region, hosting institutions like Hue University of Medicine and Pharmacy and Da Nang University of Medical Technology and Pharmacy.

In terms of sectoral insights, the public sector maintains a majority stake with 22 institutions, emphasising its significant role in providing medical education opportunities and sustaining the healthcare workforce supply. On the other hand, the private sector contributes 11 institutions, signifying a growing role in medical education. The emergence of private institutions adds diversity to the sector, offering alternative paths for aspiring healthcare professionals. Currently, among all international programmes or those following international standards in Vietnam, only VinUni has a medical education ram. This programme is developed in collaboration with a U.S. university (University of Pennsylvania), conducted entirely in English, and features a selective admissions process, attracting students with strong academic capabilities from the secondary education level.

In terms of the institutional models, the Hospital – University model is being replicated across Vietnam, showing a strong tie-up between medical training and practical healthcare, improving the quality of medical education. This approach offers valuable hands-on training for medical students, enhancing their skills. It benefits hospitals and universities alike, ultimately providing better healthcare services to the community. Currently, about 20 universities in Vietnam are adopting this model effectively. Notable examples include Hue University of Medicine and Pharmacy Hospital, which serves as an important healthcare centre in the Central region, and the Ho Chi Minh City University of Medicine and Pharmacy's Medical Centre, which has been affiliated with the university for over 30 years. Additionally, Tra Vinh University Hospital, established in 2017, applies a modern healthcare approach integrating patient care, education, and scientific research to address the increasing needs in the Mekong Delta. In the future, this model is expected to expand widely. For instance, the upcoming School of Medicine – Vietnam National University in Ho Chi Minh City's project is designed as a Hospital - University setup, with rooms for 3,000 students and 500 beds focusing on education, research, tech applications, and community healthcare. Similarly, the Hue University of Medicine and Pharmacy is on track with Resolution No. 54-NQ/TW. They aim to upgrade their Hospital and University to meet the standards of Southeast Asia and beyond. Meanwhile, the Buon Ma Thuot University of Medicine and Pharmacy Hospital, the first non-public hospital in the Central Highlands, is expanding its capacity under the Hospital - University model, adding 200 beds by 2025 and planning for an extra 300 beds by 2026 with an integration of research, education, and healthcare.

#### Total number of doctors in-take during 2019 – 2023, break down by general / specialised doctors and by regions

| Regions                    | 2019 (*)     | 2020         | 2021         | 2022         | 2023         | Total         |
|----------------------------|--------------|--------------|--------------|--------------|--------------|---------------|
| <b>The Northern Region</b> | <b>4,050</b> | <b>6,072</b> | <b>6,868</b> | <b>8,119</b> | <b>8,919</b> | <b>34,028</b> |
| General                    | 3,335        | 3,735        | 4,062        | 4,142        | 4,172        | 29,446        |
| Specialised                | 715          | 2,337        | 2,806        | 3,977        | 4,747        | 14,582        |



| Regions                    | 2019 (*)     | 2020          | 2021          | 2022          | 2023          | Total         |
|----------------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| <b>The Central Region</b>  | <b>880</b>   | <b>1,292</b>  | <b>1,000</b>  | <b>1,040</b>  | <b>1,250</b>  | <b>5,462</b>  |
| General                    | 740          | 760           | 790           | 810           | 1,020         | 4,120         |
| Specialised                | 140          | 532           | 210           | 230           | 230           | 1,342         |
| <b>The Southern Region</b> | <b>4,250</b> | <b>7,230</b>  | <b>7,307</b>  | <b>8,497</b>  | <b>7,298</b>  | <b>34,582</b> |
| General                    | 3,390        | 3,610         | 3,680         | 4,198         | 4,142         | 19,020        |
| Specialised                | 860          | 3,620         | 3,627         | 4,299         | 3,156         | 15,562        |
| <b>Grand total</b>         | <b>9,180</b> | <b>14,594</b> | <b>15,175</b> | <b>17,656</b> | <b>17,467</b> | <b>74,072</b> |
| General                    | 7,465        | 8,105         | 8,532         | 9,150         | 9,334         | 42,586        |
| Specialised                | 1,715        | 6,489         | 6,643         | 8,506         | 8,133         | 31,486        |

*Note: Specialised doctor training programs include dentistry, specialised doctor Level – I, Level – II and Resident Doctor*

*(\*) Data in these years are publicly limited*

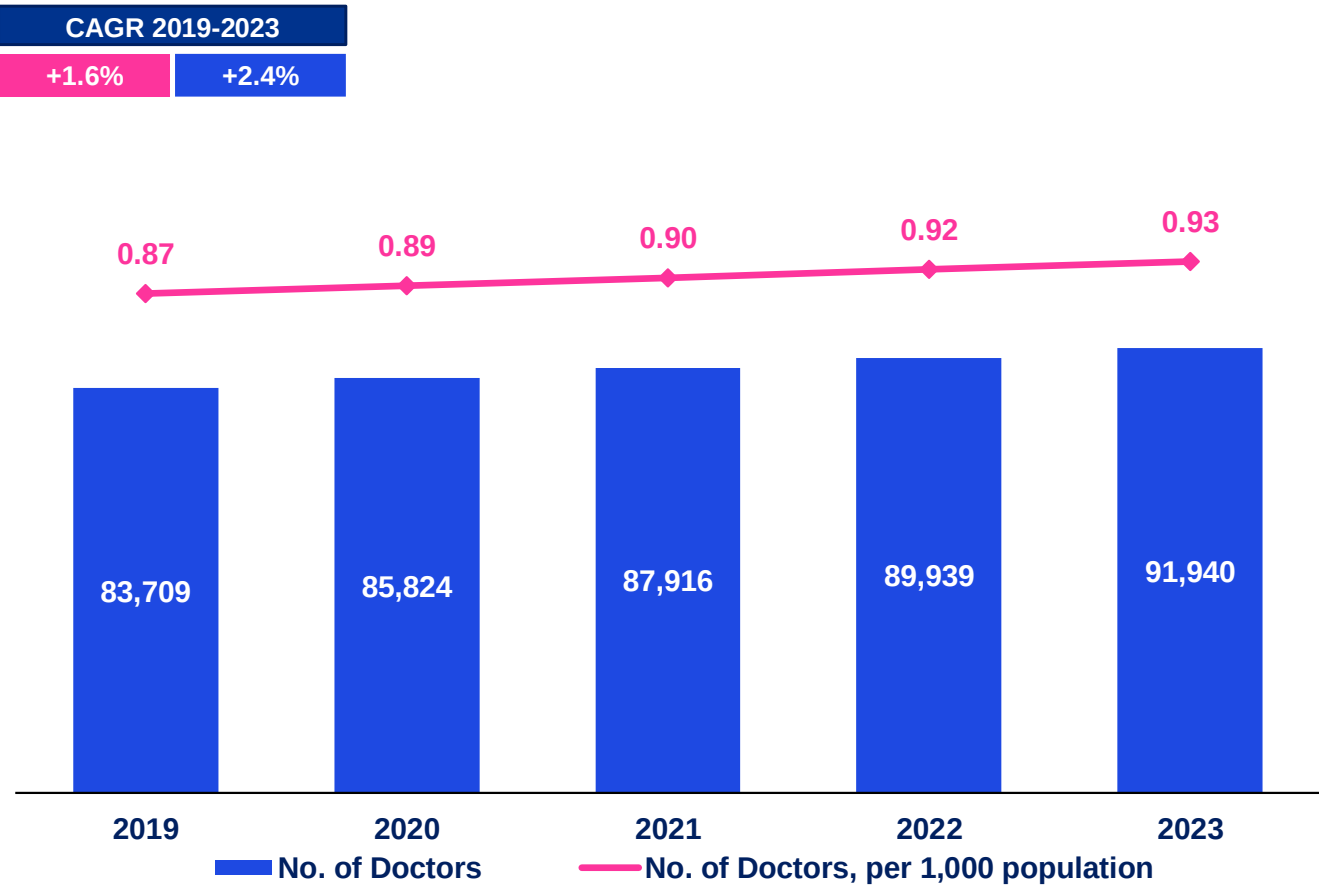
*Source: Universities' admission portals, KPMG's research and analysis*

In general, the total number of doctors taken into training in Vietnam between 2019 and 2023 witnessed an increase from 9,180 to 17,467. The general doctor intake displayed consistent growth, rising from 8,105 in 2020 to 9,334 in 2023, reflecting a CAGR of 7.3%. On the other hand, the specialised doctor intake experienced a higher rate of 12.0% annually, growing from 6,489 in 2020 to 8,133 in 2023. The comparison suggests a strategic emphasis on specialised medical services, aligning with the evolving healthcare landscape.

The Southern Region saw the doctor intake rise to 8,497 in 2022, reflecting a growing emphasis on healthcare infrastructure and services. Similarly, the Northern Region also shows positive growth, indicating ongoing efforts to strengthen the healthcare sector. Meanwhile, the Central Region exhibits steady growth, albeit slightly slower, signalling a sustained commitment to healthcare workforce enhancement.



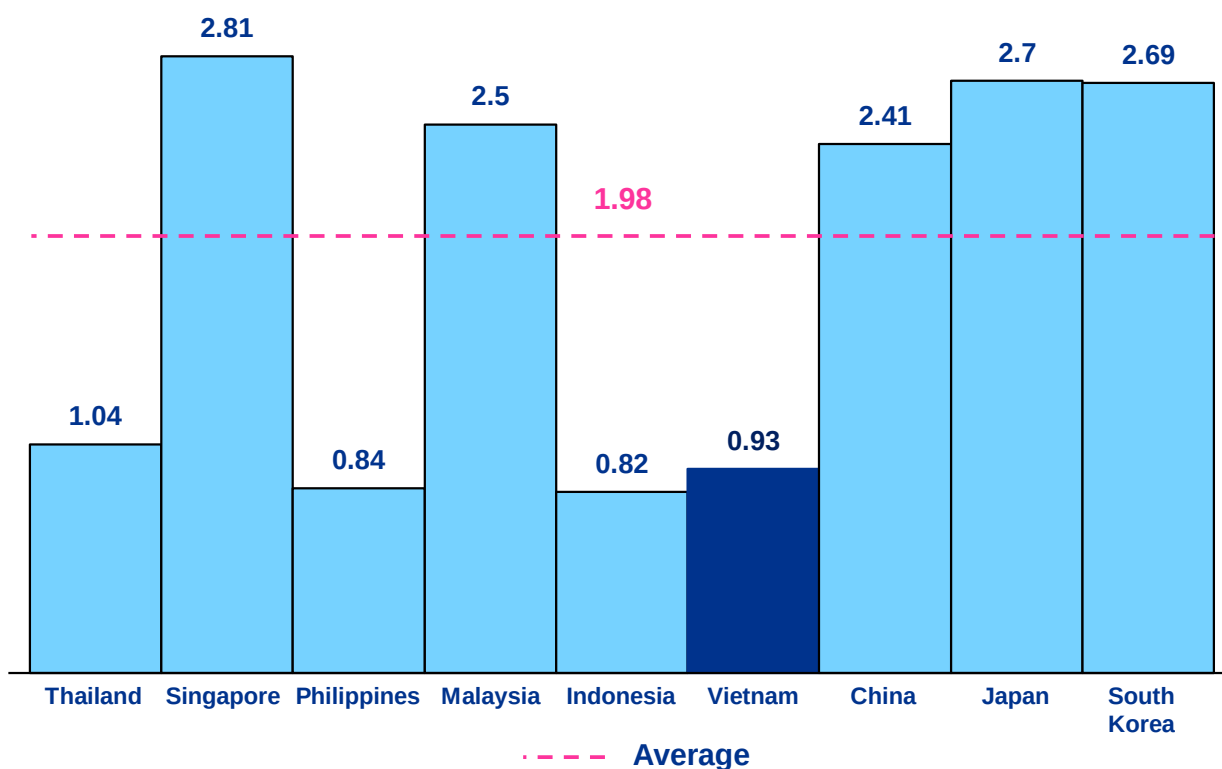
# Total number of Doctors and number of Doctors per 1,000 population in Vietnam from 2019 – 2023



Source: *Economist Intelligence Unit (EIU), KPMG’s research and analysis*

Over the period, there had been a consistent increase in the total number of doctors at a rate of 2.4% p.a., reaching 91,940 in 2023. The density of doctors per 1,000 of the population had also shown a gradual upward trend at a CAGR of 1.6%, going from 0.87 in 2019 to 0.93 in 2023. This positive trend in both the absolute number of doctors and their density reflected an improvement in Vietnam’s healthcare workforce. The country has made strides in addressing the demand for healthcare professionals, potentially enhancing its ability to provide medical services to the growing population. However, when compared to the average number of doctors per 1,000 of the population in other countries, Vietnam is still below average.

## No. of Doctors, per 1,000 of population between countries in 2023



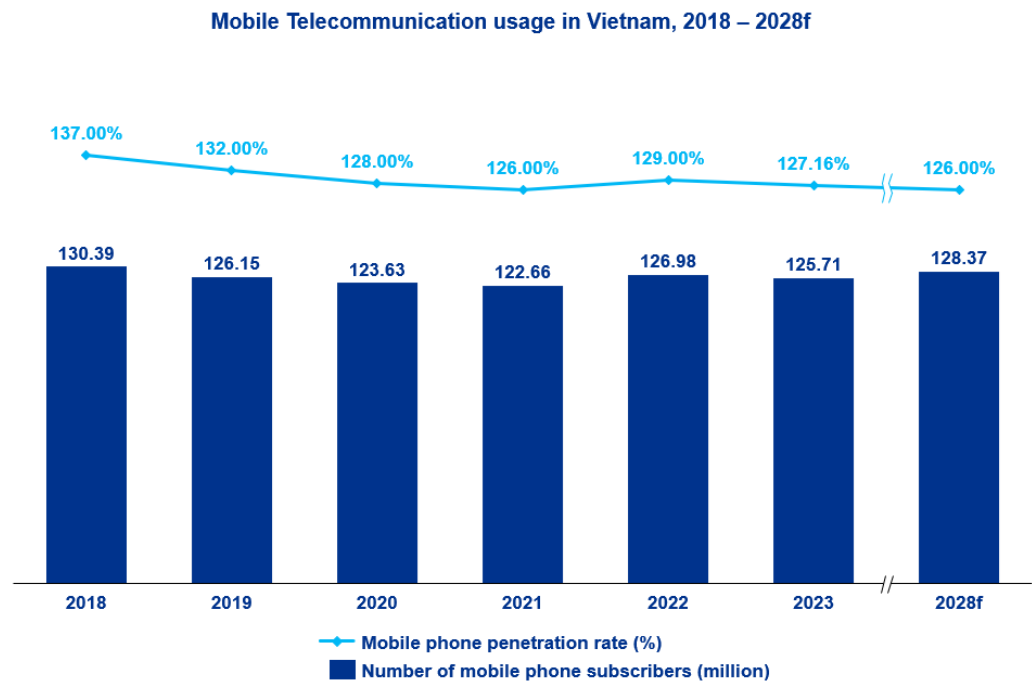
*Note: Average value includes the 8 observed countries and excludes Vietnam*

*Source: Economist Intelligence Unit (EIU), KPMG's research and analysis*

In 2023, Vietnam exhibited a doctor density of 0.93 per 1,000 people, falling below the average of 1.98 in neighbouring countries in Asia. Compared to regional counterparts like Thailand, Singapore, and Malaysia, Vietnam's doctor density was considerably lower. This underscored a potential gap in healthcare resources, emphasising the need for strategic initiatives to address the shortage. Bridging this gap is crucial for improving the overall quality and accessibility of healthcare services in the country. This is also recognised by the Vietnamese Government as taking the current healthcare status into consideration in Resolution No. 81/2023/15 and the National Master Plan for 2021–2030, with a vision scheduled for 2050 outlining the target of achieving 1.9 doctors per 1,000 population by the year 2030.

# 1.1.2. Current Country Readiness for Healthcare Digital Infrastructure Implementation

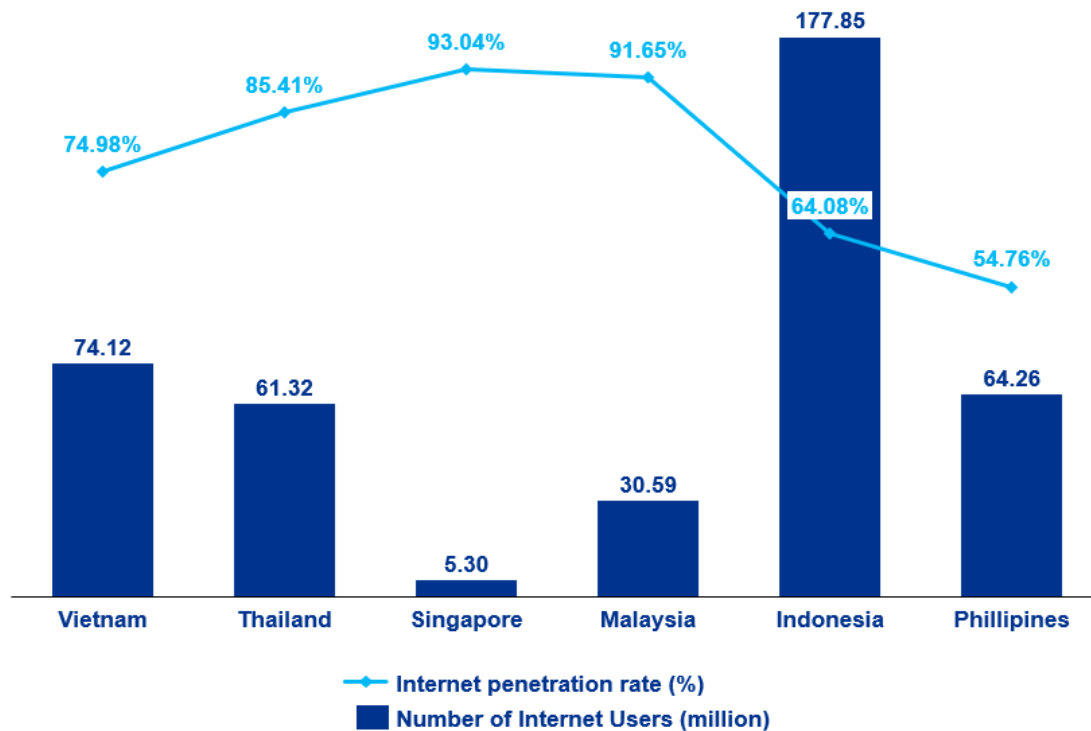
## 1.1.2.1. Telecom infrastructure in Vietnam



Source: Fitch Solutions

Vietnam's telecommunications infrastructure has not only undergone significant development but is also poised for further expansion, establishing a robust foundation for the incentivization and advancement of a Digital Health Hub in the country. This growth was marked by Vietnam's high mobile adoption, evident by its mobile penetration rate, which stood at 127.16%, recording 125.71 million subscribers in 2023. This particularly provided positive implications for the development of a digital health hub, given the prominence of mobile phone usage in telehealth diagnosis, treatment, and care. Furthermore, these figures point at a growing inclination among the Vietnamese populous to embrace on-demand and user-friendly digital services, highlighting an opportunity for hospitals and universities to integrate digitally driven systems that cater to this trend, thus addressing the evolving demand and demographic shift.

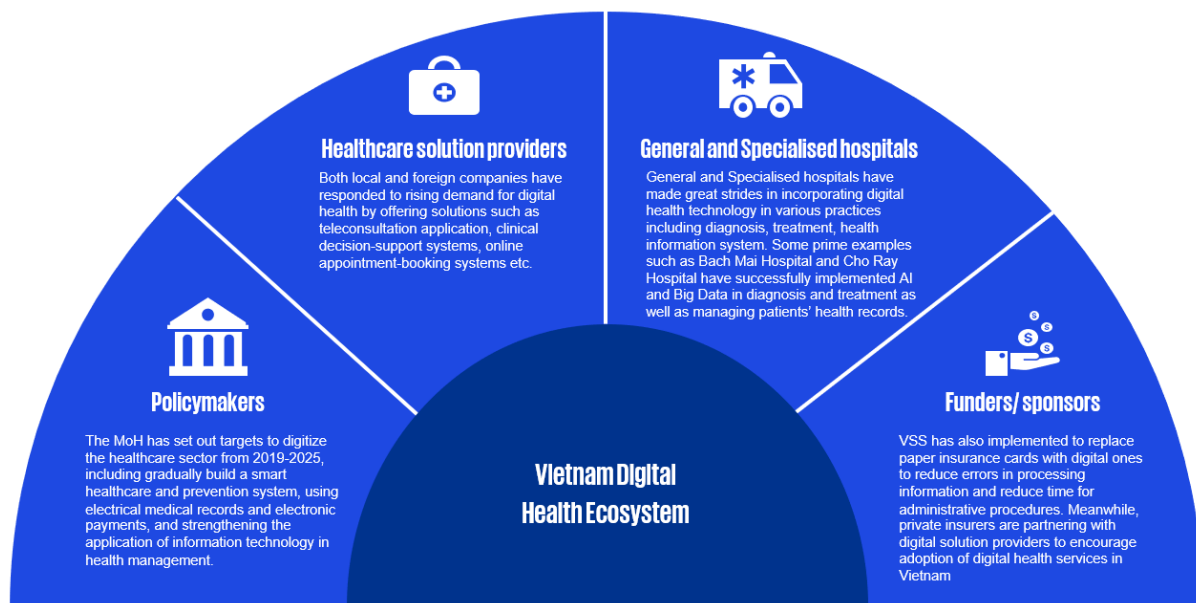
### Regional Benchmark for Number of Internet Users 2023



Source: Euromonitor

Moreover, internet accessibility in Vietnam has witnessed tremendous growth given its increased integration into the global economy, high mobile penetration rates, and rapid economic development. This swift expansion of digital awareness and internet integration into Vietnam's socioeconomic fabric became even more apparent when juxtaposed with regional counterparts such as Indonesia or the Philippines, both exhibiting considerably lower internet penetration rates of 64.08% and 54.76% in 2023, respectively. High internet adoption and rising awareness of digital systems in Vietnam have continually been key catalysts for driving a larger potential user base for telehealth services in the foreseeable future. Over time, the escalating prevalence of digital adoption is anticipated to elevate average levels of digital literacy and increase demands for convenient as well as on-demand health services.

### 1.1.2.3. Local digital health ecosystem and key stakeholders



*Source: Government and ministry's sources, company websites, hospital portals, KPMG research and analysis*

The ecosystem of digital health in Vietnam necessitates extensive cooperation between several public and private players, consisting of four main parties: policymakers, healthcare solution providers, general and specialised hospitals, and funders. The formulation of objectives and the creation of legal corridors to encourage the digital transformation of the Vietnamese healthcare system are primarily carried out by policymakers like the Ministry of Health and the Electronic Health Administration. These government bodies work closely with healthcare solutions providers, with the essence of major technology powerhouses such as FPT, VNPT, and Viettel, as well as hospitals, in developing and implementing digital health technologies such as EHRs and AI, ensuring that these applications meet the needs of both patients and healthcare professionals. Extensive efforts to establish a comprehensive digital health ecosystem would need the contribution of funders from the public sector, such as Vietnam Social Security, and private investors to ensure sustainable growth and innovation in the healthcare industry. By fostering collaboration between government agencies, technology companies, and healthcare providers, Vietnam can continue to advance its digital health infrastructure and improve overall patient care outcomes.

### 1.1.2.4. Digital health initiatives in Vietnam

The two years of COVID-19 outbreaks and Vietnam's ambitions for digital transformation have expedited the digital disruption of the healthcare sector. This has spurred efforts to digitise the health sector, including the promotion of health information technology, telemedicine, and consumer health electronics, as well as the integration of Artificial Intelligence (AI) and Big Data into digital health applications. While Vietnam is still in the early phases of implementing Industry 4.0 technologies, the nation is making strides in technical innovation and attempting to accelerate its agenda for digital transformation.

#### **Health Information Technology:**

- **Level of implementation:** Since June 2018, Vietnam has set the goal of promoting Electronic Health Records (EHRs). Under the government plan for the deployment of EHRs (Decision No.

5349/QĐ-BYT), at least 80% of people in provinces and central-affiliated cities would have EHRs in 2020. 95% of the population nationwide would have possessed EHRs, had their health information regularly updated, and would have been connected to all healthcare facilities across the country. Circular 46/2018, issued by the MOH, outlined the target that by 2023, first-class hospitals and higher must implement electronic medical records, and in the 2024–2028 period, all health facilities nationwide are expected to apply EHRs. Currently, only 50 public and private medical facilities out of the total 1,300 medical establishments nationwide have officially transitioned from paper medical records to electronic ones. Emerging EHR providers, such as FPT.eHospital, are quickly gaining traction in Vietnam and have proven to be a successful case study for facilitating widespread implementation. FPT.eHospital has achieved considerable success and been widely implemented across over 400 hospitals and clinics, including leading hospitals such as the University of Medicine and Pharmacy Hospital, Cho Ray Hospital, Bach Mai Hospital, and the Hospital for Tropical Disease. The entrance of foreign solution providers could also offer more diverse options for hospitals in HCMC. However, GDPR and the Data Protection Regulation Framework, such as Decree No. 13/2023/ND-CP, need to be taken into account when solutions from foreign providers are utilised to comply with data confidentiality protocols.

- **Implications/Gap:** Health information technologies play a critical role in building a digital health network as a foundational pillar for a smooth operation. While extensive efforts to implement health information technologies across medical facilities have been illustrated, there are several factors that need to be considered:
  - **Financial constraint:** to effectively implement health information technologies and other information infrastructure, hospitals are required to make a substantial initial investment.
  - **Inadequate human resource training:** only when healthcare personnel receive sufficient instruction to become acquainted with the digital systems will the hospital be able to fully utilise these medical information technologies. Medical facilities may find this difficult since they will need to allocate funds and provide time for personnel preparation.
  - **Laws protecting patient data from cybersecurity threats and data privacy:** compliance with Vietnam's data localisation regulations (Decree 53/2022/ND-CP) may pose challenges for cloud service providers operating internationally in terms of cybersecurity threats and data privacy.

### *Technology interventions:*

- **Level of implementation:** With the emergence of technology such as AI and Big Data, medical facilities are making great strides in incorporating these technologies in diagnosis and treatment procedures. A prominent example is Binh Dan Hospital, which has recently implemented robots to facilitate surgeries related to urological, digestive, liver, pancreas, and thoracic diseases as well as endoscopic surgery on shoulder, hip, and knee joints with interventional endovascular methods, ensuring the highest preservation for patients. Another notable initiative is that Cho Ray Hospital has introduced the application of AI in analysing blood cell images and interpreting pathology results automatically using algorithms. Additionally, as younger demographics become more health conscious, there is an increasing trend towards purchasing wearable devices in order to maintain their health conditions and act on personalised health data. A survey conducted over 3,000 participants in Vietnam illustrated that around a third of the participants own some forms of wearable equipment, which demonstrates the rising awareness of monitoring personal well-being.
- **Implications/Gap:** While the implementation of these technologies greatly contributes to accurate and timely patient care and alleviates resource constraints, there are certain barriers that need to be considered:
  - **Financial constraints to roll-out:** implementing advanced technologies such as AI and Big Data requires significant investments to be well-functioning in the daily procedures.
  - **Absence of adequate capable human resources and practice:** as the adoption of these technologies is a nascent stage, there is still a lack of highly skilled healthcare



professionals who can utilise the full potential of these cutting-edge technologies in diagnosis and treatment procedures.

- o **Wearables are perceived as unnecessary:** the majority of the population, especially in rural areas, perceives owning a wearable device such as commercial smartwatches or sports monitoring devices as excessive since they have already owned a mobile phone. This is demonstrated as a typical wearable in Vietnam range from USD200 to USD400, while the average monthly income per capita is a little below this range, standing at USD190.

### **Artificial Intelligence and Big Data:**

- **Level of implementation:** Vietnam is at an early stage in incorporating Artificial Intelligence (AI) and Big Data into its healthcare system, with only a few of the approximately 1,300 hospitals having implemented any form of AI. Pioneering AI applications in diagnosis and treatment are evident in prominent hospitals such as People's 115 Hospital and Gia An 115 Hospital, both of which have embraced the Stanford University "RAPID" system for stroke diagnosis and treatment. In the realm of cancer diagnosis and treatment digitisation, three Vietnamese hospitals are leading the way: the National Cancer Hospital, Phu Tho General Hospital, and HCMC Oncology Hospital. These three have been chosen to participate in the pilot programme for the "IBM Watson for Oncology" AI application. Currently, there is no specific legislation governing Big Data and AI health applications, aside from the provisions outlined in the 2019 adoption of Decision 4888.
- **Implications/Gap:** AI and Big Data applications are receiving strong support from the central government. These applications are expected to drive the advancement of digital health infrastructure, enable new R&D, and enhance healthcare delivery capabilities. However, the progressive development of these applications could be hampered by these factors:
  - o By using solutions that are created based on the databases of high-income countries, there is an exposed risk that these systems will not be able to examine and interpret the trends and patterns of the population in middle-income countries such as Vietnam, thus ultimately leading to significantly inaccurate outputs.
  - o **Precision in interpreting patient data and standardising data:** accuracy becomes paramount as healthcare data, including personal health records, can be prone to errors and inconsistencies. Hence, it is of vital importance to ensure patient healthcare records are streamlined as well as interpreted precisely.
  - o **Presence of proficient healthcare professionals capable of utilising AI and Big Data tools**
  - o **Accuracy and reliability of existing diagnoses, forming the foundation for AI and Big Data applications**

### **Telemedicine**

- **Level of implementation:** In April 2020, the Ministry of Health and the Ministry of Information and Communications (MIC) launched a telemedicine programme in Hanoi intended to allow users to access virtual medical examinations and treatments. In September 2020, the programme was extended to connect 1,000 health facilities and four leading medical facilities in Hanoi and Ho Chi Minh City, including Bach Mai Hospital, Huu Nghi Viet Duc Hospital, Hue Central Hospital, and Cho Ray Hospital. Phu Tho General Hospital (PGH) was one of the first hospitals to implement a telehealth clinic; they reported that it resulted in shorter diagnosis times, faster and better patient management, shorter lengths of hospitalisation and intensive care unit stays, improved diagnostic accuracy in triage, reduced anxiety, better education, increased confidence, and fewer unnecessary procedures.' In addition, the Vietnamese government approved a scheme for "remote medical examination and treatment for 2020–2025, as stated in Decision No. 2628/QĐ-BYT. The initiative aims to reduce the burden on central hospitals, increase the quality of medical examination and treatment in primary healthcare facilities, save costs, and improve patients' experiences and satisfaction while ensuring the safety of medical staff, doctors, and patients during the COVID-19 pandemic. Insurance companies such as Manulife have also participated

in telehealth applications, as illustrated by their partnership with Wellcare, a technology solution provider that helps people access remote medical assessments. Realising the potential economic viability that telehealth can bring forward, hospitals are now accelerating their progress in adapting this concept into their operations, and the execution of telehealth requires sufficient infrastructure with a digitally capable workforce. To maximise the value of telehealth applications, hospitals are encouraged to cooperate with technology solution providers and insurance firms to construct a tailored and comprehensive offering for patients.

- **Implications/Gap:**
  - o **The current legal framework regarding telemedicine focuses on diagnosis, training, technology transfer, and teleconsultation**, but there have not been policies on protecting the rights and responsibilities of doctors and patients yet.
  - o **The lack of sufficient infrastructure in terms of equipment** also impedes the ability to stipulate telemedicine on a wider scale. Hence, there is a need for synchronisation of investments to alleviate necessary infrastructure within hospitals while also promoting education on the advantages of using telemedicine.
  - o **The majority of the Vietnamese population is not fully aware of telemedicine** due to a lack of knowledge and guidelines on how to utilise this concept, as well as limited access to telemedicine.

## 1.2. Understanding the current state of Ho Chi Minh City

Ho Chi Minh City (HCMC) has made considerable strides in digitising its healthcare system through various initiatives and partnerships. Collaborations with both national and international institutions have been key to driving progress. For instance, the HCMC University of Medicine and Pharmacy established partnerships with Anhui Medical University (China) and Yonsei University (Korea) for research projects, while strategic partnerships with Harvard University (U.S.), organisations from the Netherlands, Australia, and Canada, provide access to global expertise. Moreover, in-house training centres in major hospitals have been established to equip healthcare professionals with advanced medical techniques. Also, HCMC's Resolution No. 31/NQ/TW promotes legal frameworks for the development of digital health. This framework embeds efforts to foster improved quality of healthcare providers, promote digital health literacy and awareness among the community, and encourage foreign domestic investment in digitalisation.

However, HCMC still faces challenges, including inadequate digital infrastructure, limited funding, IT personnel, and a shortage of healthcare professionals that require urgent attention to improve healthcare delivery. On the other hand, the city's strengths, including strong digitalisation capability, support from the Department of Health, and advanced medical training, have propelled the progress made so far. Yet, increasing patient awareness and outreach continues to be a critical challenge as the city continues to digitise its healthcare system.

Despite the challenges, HCMC's digitization of healthcare presents profitable opportunities in the face of the city's ageing population, smart hospital model adoption, and growing medical tourism sector. Nevertheless, risks arise from cyber threats to electronic patient information, a lack of interoperability standards, and inconsistent data privacy laws.

To sustain the progress made so far in digitising HCMC's healthcare system, collaborative efforts among stakeholders remain crucial to overcome identified challenges, optimise opportunities, and maintain momentum.

### 1.2.1. Current landscape of Medical Training in Ho Chi Minh City

In light of Vietnam's burgeoning state of digital integration and augmented telecommunication infrastructure explored above, HCMC, as its largest and most industrious metropolis, is well positioned to lead innovation efforts in addressing socio-economic challenges through digital solutions. To achieve

success within the realm of digital healthcare, the presence of a capable and adaptable health framework that can seamlessly integrate and adopt digital, on-demand services and systems is essential. Therefore, the following section aims to assess this capability within HCMC, specifically by providing an overview of its medical training, hospital, and health infrastructure, elucidating the challenges faced, and examining the proactive measures undertaken by the government to address these issues.

### ***1.2.1.1. Overview of medical training universities in Ho Chi Minh City***

Being one of the most technologically developed cities in Vietnam, HCMC always stays up-to-date on the latest advancements in various fields, including healthcare and medical education. Currently, the majority of Ho Chi Minh City's medical education takes place in three public universities: Ho Chi Minh City University of Medicine and Pharmacy, Pham Ngoc Thach University of Medicine, School of Medicine – Vietnam National University, Ho Chi Minh City, and two private universities, Nguyen Tat Thanh University and Hong Bang International University. With high-quality training programmes, in 2022, the total medical student's intake for general and specialised doctors in Ho Chi Minh City was 1,248 and 721, respectively.

Overall, the public universities are responsible for the training of most medical students in Ho Chi Minh City. Ho Chi Minh City University of Medicine and Pharmacy offers comprehensive medical training for healthcare professionals and graduates, focusing on practical skills and cutting-edge techniques to prepare them for the evolving medical field. Alongside Ho Chi Minh City University of Medicine and Pharmacy, Pham Ngoc Thach Medical University offers frequent training programmes, enhancing medical professionals' capabilities in ultrasound and diagnostic imaging. In addition, the School of Medicine – Vietnam National University, Ho Chi Minh City, with the orientation of being an advanced and high-quality training unit based on the model of Hospital - School, closely combines training with scientific research and health care provision.

### ***1.2.1.2. Collaboration programs between Ho Chi Minh City medical universities and international partners***

Ho Chi Minh City stands as a beacon of high technical development, notably in healthcare. The city has made significant strides in advancing medical technologies and services, positioning itself as a hub for cutting-edge healthcare solutions. Cutting-edge hospitals equipped with advanced diagnostic and treatment facilities dot the cityscape, reflecting its commitment to providing top-notch medical care. One key driver of this progress is the city's medical universities active engagement in international collaborations with prestigious medical schools. Through partnerships with renowned institutions worldwide, Ho Chi Minh City has been able to leverage global expertise, exchange knowledge, and foster innovation in medical research and education.

|                             | HCMC University of Medicine and Pharmacy                                                         |                                                                   | Pham Ngoc Thach Medical University    |                              | School of Medicine - Vietnam National University |                                                                                                                                         | Oxford University Clinical Research Unit |               |
|-----------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------|------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------|
|                             | Domestic                                                                                         | International                                                     | Domestic                              | International                | Domestic                                         | International                                                                                                                           | Domestic                                 | International |
| Exchange program            | • N/A                                                                                            | • Anhui Medical University (China)<br>• Yonsei University (Korea) | • Thu Dau Mot University (Binh Duong) | • N/A                        | • N/A                                            | • Otago University (New Zealand)<br>• Tzu Chi University (Taiwan)                                                                       | • N/A                                    | • N/A         |
| Educator training resources | • University of Economics Ho Chi Minh City (HCMC)<br>• Pham Ngoc Thach Medical University (HCMC) | • Harvard University (US)                                         | • N/A                                 | • Texas Tech University (US) | • N/A                                            | • Indiana University (US)<br>• Ishiikai Medical Association (Japan)<br>• Johns Hopkins University (US)<br>• Tzu Chi University (Taiwan) | • N/A                                    | • N/A         |

|                                  | HCMC University of Medicine and Pharmacy |                                                                                                                                       | Pham Ngoc Thach Medical University                                                                                                |                                                                                                                                                   | School of Medicine - Vietnam National University                                                                                     |                               | Oxford University Clinical Research Unit |                                                                                                                                                                                                          |
|----------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | Domestic                                 | International                                                                                                                         | Domestic                                                                                                                          | International                                                                                                                                     | Domestic                                                                                                                             | International                 | Domestic                                 | International                                                                                                                                                                                            |
| Collaborative education programs | • N/A                                    | • Medical Committee Netherlands-Vietnam, Trinh Foundation Australia, University of Alberta (Canada), University of Sydney (Australia) | • Thu Dau Mot University (Binh Duong)<br>• Institute of Medical Genetics (HCMC)<br>• Dong Nai University of Technology (Bien Hoa) | • University Medical Center of Johannes Gutenberg University (German)<br>• Sorbonne University (France)<br>• Grenoble - Alpes University (France) | • Thu Duc City Hospital (Thu Duc City)<br>• Trung Vuong Hospital HCMC (HCMC)<br>• Ho Chi Minh City Drug Testing Institute HCM (HCMC) | • Tzu Chi University (Taiwan) | • Hospital for Tropical Disease          | • Imperial College London (United Kingdom)<br>• King's College London (United Kingdom)<br>• University of Oxford (United Kingdom)<br>• University of Melbourne (Australia)<br>• ETH Zurich (Switzerland) |

### Ho Chi Minh City University of Medicine and Pharmacy

For domestic collaborations, Ho Chi Minh City University of Medicine and Pharmacy and University of Economics Ho Chi Minh City signed a cooperation agreement for the period of 2023 to 2028 with the conditions of sharing resources and learning experiences not only in the training of the school but also in administration. The collaboration would assist in connecting the implementation of research and consulting projects as well as attracting human resources. In addition, in 2020, Ho Chi Minh City University of Medicine and Pharmacy, together with Pham Ngoc Thach Medical University, went through an educator training programme with the assistance of Texas Tech El Paso University with the aim of improving skills in teaching, scientific research, clinical practice, and leadership.

As the leading institution for medical graduates in the city, Ho Chi Minh City University of Medicine and Pharmacy also places a strong emphasis on international collaboration programmes to enhance its educational and research capabilities. In 2022, a partnership was established with Harvard Medical School, involving faculty exchange to support objectives such as medical education innovation and capacity building. Additionally, the university initiated an exchange programme with Yonsei University, Korea, to boost knowledge through research projects conducted by selected candidates for six months. Another notable collaboration from 2017 to 2022 focused on speech and language therapy training development in conjunction with the Medical Committee Netherlands-Vietnam and the Trinh Foundation Australia, featuring international experts as lecturers. Furthermore, an exchange programme with Anhui University of Chinese Medicine, China, was established in 2019, encompassing student exchange and

collaboration on traditional medicine resources. These initiatives reflect the university's commitment to fostering global partnerships for the advancement of medical education and research.

### ***Pham Ngoc Thach Medical University***

Pham Ngoc Thach Medical University is one of the most active universities in domestic collaboration, with various collaborative training programs. In 2022, collaborating with Thu Dau Mot University, the two universities agreed to receive students for internships, coordinate training, and improve the professional skills of medical staff. Also in 2022, the university collaborated with Dong Nai University of Technology to establish cooperation in the fields of exchanging lecturers, medical students, and technology applications. Furthermore, Pham Ngoc Thach Medical University also works together with the Institute of Medical Genetics to develop scientific research programmes, international publications, and continuing education programmes.

Pham Ngoc Thach Medical University has also established notable collaborations with international universities, showcasing a commitment to elevating medical education and research standards. Since 2013, the university has partnered with the University Medical Centre of Johannes Gutenberg - University Mainz, Germany, in a collaborative education programme focused on training doctors. This initiative, involving 200 Vietnamese lecturers and over 20 German professors, has successfully trained over 300 students in the past decade. Additionally, the university has engaged in a France-Vietnamese inter-university training programme with Sorbonne University since 2008, enhancing neurology expertise in Ho Chi Minh City through the contributions of French professors. Moreover, a partnership agreement with Texas Tech University, initiated in 2016, emphasises educator training resources, including the implementation of the Advanced Educator Development program. Furthermore, Pham Ngoc Thach Medical University offers refresher courses in biomedical radiophysics in collaboration with Grenoble - Alpes University, France. Over the years, these collaborations have positively impacted medical education, with 349 students enrolled in the Vietnamese-German Medical Faculty training cooperation programme and 70 graduates recognised for excellence.

### ***School of Medicine at Vietnam National University, Ho Chi Minh City***

Domestically, since 2022, VNU-HCM and Thu Duc City Hospital have worked together for the development of health science research programmes with the aim of enhancing research experience and providing assistance to students relating to matters of the physical health sciences. Another on-going project since 2021, VNU-HCM has collaborated with Trung Vuong Hospital (HCMC) under the agreement for students to develop in practical hospital settings, training and development of medical personnel, and updating medical resources with the latest medical advancement. In 2022, the university signed a cooperation agreement with the Ho Chi Minh City Drug Testing Institute with the purpose of advancing drug and medicine research in Vietnam.

The School of Medicine at Vietnam National University, Ho Chi Minh City (VNU-HCM) has engaged in noteworthy collaborations with foreign universities. Through the Partnership for Higher Education Reform (PHER) project, funded by the United States Agency for International Development (USAID) and implemented by Indiana University in 2023, VNU-HCM faculty and educational administrators have visited and trained at Indiana University to achieve objectives related to university governance innovation, teaching quality improvement, and research capacity strengthening. Additionally, the collaboration with Japan's Ishikai Medical Association in 2023 under the project "Training and preparation for specialists in Vietnam to use laparoscopic surgery techniques for gastrointestinal cancer" has strengthened ties, allowing for direct assessment of medical equipment and observation of surgical practices. Moreover, a dialogue with scientists from Johns Hopkins University took place in the summer of 2023, fostering exchanges and discussions on global medical issues. Furthermore, in 2023, the VNU-HCM Faculty of Healthcare signed an educational cooperation agreement with Tzu Chi University (Taiwan), encompassing student and lecturer exchanges, information exchange, as well as joint research activities. These collaborations underscore VNU-HCM's commitment to advance medical education, research, and international partnerships.



Domestic collaborations primarily centre around educator training programmes and collaborative education programs. Notably, these collaborations tend to concentrate in cities proximate to Ho Chi Minh City, streamlining the exchange of valuable resources. However, there is room for improvement to expand exchange programmes internally, foster stronger connections between the three public universities, and encourage the sharing of knowledge among future generations of medical professionals. Broadening collaborations beyond city limits and into various provinces holds the potential to elevate innovation rates and disseminate medical expertise on a wider scale. In this way, collaborative efforts can extend beyond institutional boundaries, positively impacting adjacent cities and contributing to advancements in medical techniques and procedures.

For international collaboration, Vietnam medical universities have been actively participating in international collaboration for continuous improvement and staying up-to-date with global knowledge and technologies. Having greater access to international collaboration is expected to maintain a professional relationship with cooperating countries, creating opportunities for strengthening and diversifying the skill set of health care workers in HCMC.

Besides the high-quality training programmes, the public universities also provide short-term training and intensive skills education for medical students. At Ho Chi Minh City University of Medicine and Pharmacy, training programmes such as Intravascular Ultrasound and Practice Molecular Diagnostic Techniques were offered three times a year to enhance practical training and equip students with empirical experience once they graduated. Similarly, Pham Ngoc Thach Medical University provides training on Cardiac Ultrasound - Blood Vessel Ultrasound and General Ultrasound, twice and three times per year, respectively, to prepare students with a wide range of skills. School of Medicine – Vietnam National University, Ho Chi Minh City also provides extensive training programmes such as Basal cardiopulmonary resuscitation and Anaphylactic emergency management once every year in order to orient students to the most suitable field in healthcare.

### ***Oxford University Clinical Research Unit (OUCRU)***

As a large-scale research institution that is part of the Central for Tropical Medicine and Global Health at the University of Oxford (UK), OUCRU has been actively partnering with both domestic and international partners in the form of collaborative education. OUCRU has worked alongside key leading medical universities in the UK, including Imperial College London, King's College London, and the University of Oxford. Additionally, OUCRU also partnered with ETH Zurich (Switzerland) and the University of Melbourne (Australia). The well-established, close relationship with major medical universities in the UK, Switzerland, and Australia has enabled OUCRU to gather global, multi-disciplinary expertise, resulting in high-quality clinical research outcomes with the aim of improving patients' care quality in Vietnam. Additionally, OUCRU has a longstanding post-graduate training programme that spans over 30 years. Through the programme, over 100 Vietnamese researchers earned UK PhD titles, making important contributions to key healthcare institutions in Vietnam.

Besides leading academic institutions, OUCRU also works alongside major hospitals in Vietnam to conduct clinical research and boost the current service quality in healthcare facilities. The institution partnered with the Hospital of Tropical Disease in HCMC to contribute joint efforts to conducting clinical research in the field of innovative treatment methods and assessing the effectiveness of treatment protocols. OUCRU's determination and effort in fostering domestic and international collaboration have resulted in remarkable clinical research achievements since its establishment in Vietnam. Through its effort with the Hospital for Tropical Disease to research the best treatment regimen for malaria, OUCRU, together with the Hospital for Tropical Disease, has successfully reduced the death rate caused by malaria to 10% by 2000. OUCRU has also accomplished new achievements in their clinical research on the topics of tetanus, brain infection, HIV, and dengue. These are critical clinical research outcomes that allow the Vietnamese healthcare system to improve its diagnosis and treatment quality, providing high-quality, specialised care solutions that can cater to different patient needs on an economical scale.

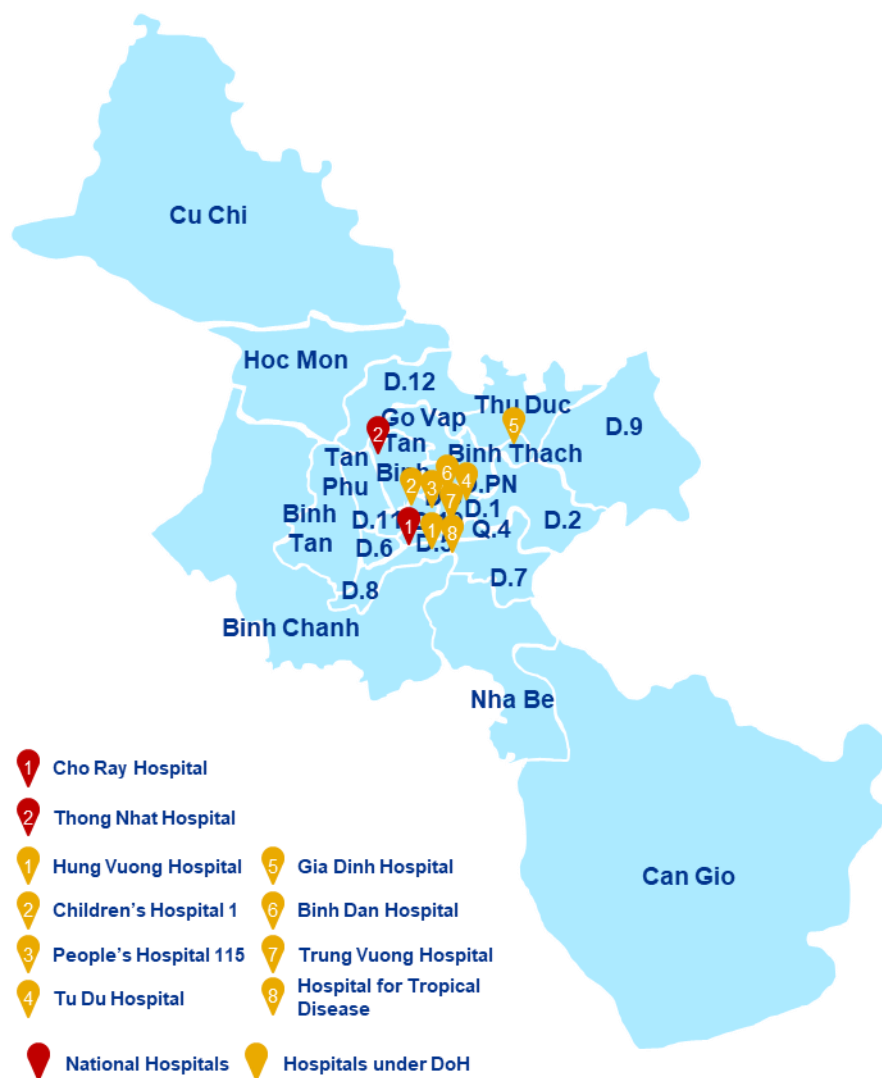


In 2023, OUCRU has cooperated with the HCMC Department of Health, HCMC Eye Hospital, and HCDC to identify the root causes of pink eye disease (i.e., acute conjunctivitis) in light of the wide spread of pink eye disease in HCMC. This collaboration targets determining key factors that may potentially trigger pink eye disease in patients, contributing to the devising of preventive measures to manage and control the spread of the disease. OUCRU has also visited the HCMC Hospital of Dermatology – Venerology to discuss collaboration opportunities to conduct joint clinical research on the topic of sexually transmitted infection (STI), which aims to highlight the causes of the disease and also potential solutions to prevent and treat STI. As a result, this potential partnership between both sides is expected to help the HCMC Hospital of Dermatology – Venerology enhance its current treatment capability for STI disease.

As part of its commitment to contribute to Vietnam's and HCMC's healthcare systems, OUCRU has also extended its partnership with other stakeholders to elevate its clinical research outcomes. Most notable is OUCRU's recent MOU with the Ho Chi Minh City Centre of Disease Control (HCDC) in 2023 to enhance collaborations in preventive medicine activities. The coverage areas under this partnership expand from technical expertise to clinical research practice. In which, under the category of technical expertise, both sides will collaboratively provide training programmes to improve HCPs' diagnosis capability for infectious diseases, enhance epidemic data analysis and laboratory management, and promote clinical research that meets GCP and GLP standards. At the same time, OUCRU and HCDC will continue working on their ongoing projects on vital health topics such as assessing the public's immunity for measles and other diseases that can be prevented by vaccines, assessing current emerging infectious diseases, and evaluating potential preventive solutions for HCDC. The strategic partnership between OUCRU and HCDC is claimed to have significant impacts on HCMC's healthcare system, especially HCDC, as this will allow HCDC to improve its current competency in preventive medicine activities, resulting in a higher quality of patients' treatment service in HCMC.

Not only does OUCRU care about improving the quality of Vietnam's and HCMC's patients' treatment capabilities, but the institution also puts strong efforts into supporting HCPs and enhancing the capacity of frontline workers and vaccination field workers. These initiatives include holding workshops, webinars, and organising a knowledge hub to provide training materials and resources for HCPs in Vietnam. Recently, as part of OUCRU's Public and Community Engagement commitment, OUCRU has participated in "Mental Health Care for Healthcare Workers in Ho Chi Minh City," a webinar organised by HCDC with the aim of shedding light on the cruciality of mental health to HCPs and providing guidance on how HCPs can protect and strengthen their mental wellbeing. In this webinar, OUCRU's Psychological Advisor has shared her experiences on the topic of mental health in healthcare work and also provided insightful advice on how to cope with stress and maintain mental health in a hospital environment.

## 1.2.2. Current in-house training centres in Ho Chi Minh City



Cho Ray Hospital, Thong Nhat Hospital, and other hospitals under the HCMC Department of Health, such as Hung Vuong Hospital and Children's Hospital 1, contribute a considerable range of training sessions. These sessions cover a blend of the application of technology, such as diagnostic imaging and ultrasound operations, and practical guidance in fields such as endoscopy and cardiovascular-related areas on a regular basis, following strict requirements for more advanced knowledge and techniques to ensure the attendees have satisfied a certain skill level. In addition to the existing practical training, the leading hospitals in Ho Chi Minh City foster stronger collaborations with other domestic and international universities, as well as striving for partnerships with global medical institutions. This implies that leading hospitals are placing a strong emphasis on having adequate room to reinforce Ho Chi Minh City's healthcare professionals and their competency to spearhead advanced techniques and care for patients, as well as the application of new technology in diagnosis and treatment.

**Perceived as one of the leading hospitals in Ho Chi Minh City, Cho Ray Hospital has made considerable efforts in establishing programmes and initiatives with a mix of domestic parties,** such as the HCMC University of Medicine and Pharmacy, and international counterparts, such as the International University of Health and Welfare in Japan. The partnerships with Nguyen Tat Thanh University and Y Viet Company with Drager enable healthcare professionals to boost their capacities and obtain a Continuous Medical Education certification, which would be crucial for every healthcare

professional to perform future procedures. Additionally, the conference, co-organised with the HCMC University of Medicine and Pharmacy and the International University of Health and Welfare, tapped into areas that are gaining traction to address in the future, such as the advancement of medical equipment and how to develop the overall healthcare workforce. Simultaneously, Cho Ray Hospital offers a variety of annual trainings for general practitioners consisting of diagnostic imaging and practical guidance in urology, kidney transplantation, endoscopy, and otolaryngology. This demonstrates Cho Ray Hospital's commitment to improving the healthcare system by establishing collaborations with various parties and a diversified curriculum of practical training to fully realise the potential of Ho Chi Minh City's healthcare system.

**Thong Nhat Hospital is another national hospital in Ho Chi Minh City that offers a combination of collaborative training programmes and practical training.** In the first six months of 2023, Thong Nhat Hospital had organised 23 Telehealth programmes connecting with 30 units, including some leading pharmaceutical firms such as AstraZeneca and Sanofi, with an aggregate of 4,213 participants and 42,458 views on social media platforms. In addition, Thong Nhat Hospital supported the technology transfer to 5 hospitals and 7 health protection boards of provinces, with 14 packages of technology transferred to 115 receiving officials and 1,227 treated patients, including 48 surgical cases. By organising these training curricula, Thong Nhat Hospital has invigorated the healthcare workforce's knowledge and competency to deliver essential patient care as various partners from pharmaceutical firms share their modern regimens with healthcare professionals. Thong Nhat Hospital also offers various short-term courses aiming to enhance healthcare professionals' capacities in areas such as cardiology, artificial kidneys, and ultrasonography, resulting in a rise in competent healthcare professionals as they receive training from experienced doctors in the hospital.

**Hung Vuong Hospital, as one of the leading hospitals in Ho Chi Minh City, is well positioned in Paediatrics and Obstetrics. The hospital has been conducting a series of training initiatives,** such as cooperation with City Children's Hospital and Tu Du Hospital to provide support in neonatal expertise and cooperation with pharmaceutical firms such as Bayer to enhance healthcare professionals' knowledge and practical skills in obstetrics and gynaecology. Regarding practical trainings, the hospital offers a range of programmes covering topics such as obstetric ultrasound, colposcopy, and basic infection control for general practitioners. The hospital's commitment to continuous education and training programmes for healthcare professionals ensures that they stay up-to-date with the latest advancements in medical practices. This not only benefits the patients by providing high-quality care but also contributes to the overall improvement of healthcare services in Ho Chi Minh City.

**Children's Hospital 1 is a reputable paediatric hospital with a long history of operations in Ho Chi Minh City. It has been providing healthcare to a sizeable portion of the population, handling over 1.5 million medical examinations and 95,000 in-patient visits annually.** In order to augment the hospital's capacity to handle advanced techniques and align with the latest knowledge, Children's Hospital 1 has illustrated its extensive efforts to expand cooperation with multiple domestic and global parties, such as the Vietnam National Institute of Haematology and Blood Transfusion, Taipei Veteran General Hospital, Children's Heart Link, and Terumo. The hospital also provides a wide array of training programmes, including dialysis, paediatric emergency and resuscitation, and infection control techniques, with the frequency ranging from once a year to seven times a year. The combination of domestic and international cooperation with the presence of diverse practical training would spearhead the healthcare workforce's capabilities at Children's Hospital 1, allowing them to perform more intricate and sophisticated care.

**People's Hospital 115 is another prominent hospital under the HCMC's Department of Health, where the hospital primarily focuses on Cardiology, Neurology, Nephron-urology, Anesthesiology, Resuscitation – ICU, Oncology.** The in-depth expertise and experiences in these fields are also reflected in the hospital's training programmes for medical professionals who wish to further reinforce their capabilities in diagnostic imaging, Endoscopy, and Electromyography. These extensive offerings of training courses have allowed professionals to enhance both fundamental and specialised

practical abilities, thus enabling them to deliver necessary treatments for patients. Furthermore, the hospital has extended collaboration with Pham Ngoc Thach University of Medicine to establish the Hospital – University model, which would leverage the network of Pham Ngoc Thach University to strengthen the healthcare workforce's capabilities as they practice at People's Hospital 115. Therefore, it would be beneficial for the healthcare system as the overall quality of both general practitioners and specialised doctors' competency in carrying out specialised care techniques and practical diagnosis and treatment skills within Cardiovascular, Neurology, and Anesthesiology resuscitation would lead to improved patient outcomes.

**Regarding Obstetrics and Gynaecology trainings in Ho Chi Minh City, Tu Du Hospital is a reputable facility that provides updated knowledge and techniques for healthcare professionals, which has gained the trust of various families across the city.** Two remarkable initiatives that have been carried out by Tu Du Hospital are a strategic collaboration with Bayer Vietnam and the Vietnam Association of Gynaecology and Obstetrics and a partnership agreement with Vinmec Central Park, both of which are tailored to improve the gynaecology and obstetrics expertise of healthcare professionals in Ho Chi Minh City. At the same time, a diversified range of practical trainings are offered by the hospital, focusing on topics such as Obstetrics and Gynaecology practice, Gynaecological laparoscopic surgery, Cervical cytology, and Obstetrics and Gynaecology ultrasound operations. By implementing these initiatives and trainings, Tu Du Hospital has opened more opportunities for doctors to boost their gynaecology and obstetrics knowledge and practical skills, which would be crucial in addressing the prospective demand for obstetrics and gynaecology cases and delivering better patient outcomes.

**Gia Dinh Hospital has paid attention to extending its efforts in establishing partnerships,** such as with Bayer Vietnam in reinforcing gynaecology and obstetrics specialties, as well as partnering with Hong Bang International University to deliver trainings on fundamental knowledge and practical skills, so graduate doctors are equipped with sufficient skills to allow them to further stride. Recognised as a central hospital with various experienced doctors as well as high-quality techniques, Gia Dinh Hospital has a sophisticated portfolio of available trainings that are provided for general practitioners and specialised doctors in Ho Chi Minh City. Gia Dinh Hospital comprises trainings in matters such as COPD, infection control, and laparoscopic surgery, which are all organised once a year. The availability of these courses would leverage the overall capabilities of general practitioners and specialised doctors in Ho Chi Minh City in conducting procedures with the latest knowledge, techniques, and applications of cutting-edge technology.

**In order to improve the competencies of healthcare professionals in Ho Chi Minh City, Binh Dan Hospital has organised training programmes in collaboration with partners like the European Urology Association, Pham Ngoc Thach University of Medicine, and the HCMC Urology-Nephrology Association.** With the help of these programmes, medical professionals in the field of urology will be strengthened and given access to up-to-date information and methods that comply with global norms. Binh Dan Hospital's training programmes concentrate on abdominal and urological endoscopy, general surgery endoscopy, and percutaneous kidney stone removal techniques that are held twice a year, three times a year, and once a year, respectively. These courses are designed to cater to the specific needs of experienced general practitioners and specialised doctors. The requirements of these courses are oriented towards professionals who have graduated from medical school and have certain levels of experience working in their respective fields. This targeted approach allows for a more in-depth exploration of the latest advancements and techniques in these specific fields, ultimately leading to improved patient care and outcomes.

**Trung Vuong Hospital has engaged in two collaborations with efforts to augment health professionals and medical students' capabilities by partnering with the School of Medicine – Vietnam National University in HCMC and Hong Bang International University.** With these programmes in place, healthcare professionals and students will have additional access to high-quality training resources and the ability to exchange knowledge and technical skills with experts from these partners. Trung Vuong Hospital has prioritised the provision of several training programmes aimed at

enhancing the fundamental knowledge and technical proficiency of medical practitioners in HCMC, such as conducting emergency procedures and cardiopulmonary resuscitation (CPR). In addition, the hospital also undertook several research and development activities to ensure the hospital is up-to-date with the latest advancements in diagnosis and treatment techniques. As a result, this will enable a more efficient workforce that is capable of handling complex cases.

**The Hospital for Tropical Disease in HCMC has been actively engaging with both domestic and international partners to enhance its research and service quality.** Key topics on which the hospital commonly collaborates with other stakeholders are infectious diseases and communicable diseases, which strongly correlate with the core strength of the hospital. By placing a strong focus on research and innovation, the Hospital for Tropical Disease is able to enact state-of-the-art technology and innovative solutions that help it improve the care of its patients at a low cost. Of which, OUCRU has been one of the strategic partners of the Hospital for Tropical Disease and has been actively contributing to the clinical research progress in the hospital itself and also in Ho Chi Minh City. OUCRU has supported the Hospital of Tropical Disease in conducting clinical and laboratory research on critical fields including epidemiology, immunology, host and pathogen genetics, molecular biology, microbiology, and virology. With the dedicated support from OUCRU, the Hospital for Tropical Disease in HCMC has successfully co-delivered the VITAL project to improve critical care/ ICU quality in its service.

In addition to the traditional collaboration between medical facilities and medical universities and medical research institutions, in recent years, there has been a growing collaboration between medical facilities and engineering institutions in HCMC. More detailed information with regards to collaborations at the medical facilities in HCMC can be navigated to Appendix 1.2 at the end of the report.

Universally, the overall scheme of in-house training centres across major hospitals in Ho Chi Minh City has experienced robust growth with regards to a diversified training curriculum tailored for both general practitioners and specialised doctors. In essence, these trainings would pave the way for a more educated and skilled workforce who are equipped with the most advanced medical techniques, as demonstrated by organising regular courses focused on emerging areas such as diagnostic imaging, ultrasound, and cardiovascular. By honing practical competencies and exposing the healthcare workforce to the applications of cutting-edge technology in diagnosis and treatment, this would facilitate readiness for the implementation of a digital innovation hub in Ho Chi Minh City, while fostering collaboration and knowledge sharing among healthcare professionals would lead to a more integrated and comprehensive approach to patient care. The challenge lies in ensuring that healthcare professionals are appropriately trained in digital health technologies, given the increasing demand for such services and the paucity of institutions that offer relevant courses to meet this demand. To close this gap, it is imperative that the government and healthcare organisations make investments in increasing the number of training programmes and resources that are available. By doing this, they can guarantee that medical practitioners have the abilities and know-how needed to use digital health products efficiently and develop Ho Chi Minh City's healthcare system.

### **1.2.3. Current stage of digital infrastructure development for healthcare in HCMC**

In recent years, medical units in Ho Chi Minh City have implemented many digital applications in four major pillars, which are Health Information Technology, Technology interventions, Telehealth/telemedicine, and the applications of Artificial Intelligence (AI) and Big Data to help improve the status of the healthcare sector. With the emergence of a rapid digital transformation process in the healthcare industry, it has reinforced the overall quality of Ho Chi Minh City's healthcare system in delivering necessary care, leading to improved patient outcomes.

#### **Health Information Technology:**



- **Level of implementation:** Ho Chi Minh City stands out among other provinces in Vietnam in stimulating the application of health information technology, which is illustrated by the number of hospitals that have effectively integrated electronic health records (EHRs) into their operations and those that plan to pilot EHRs. Initiated by Ho Chi Minh City's Department of Health with the aim of articulating the digitalization of the technical catalogue evaluation and approval progress, the deployment programme of Electronic Health Records serves as a crucial foundation for monitoring and verifying compliance with approved technical catalogues. To date, 41 out of 51 hospitals have developed plans to pilot electronic medical records, and 27 out of 51 hospitals ensure to set up electronic medical records in 2023 in accordance with the Ministry of Health's roadmap. Some prime examples include HCMC Oncology Hospital, which has applied digital transformation to medical examination and treatment with the execution of an electronic medical record system that synchronises patients' test results and other data. Gia Dinh Hospital has also stipulated the recording of patient information by integrating the fingerprint system that allows patients to check their personal information, health insurance cards, and medical records. However, only a few hospitals have successfully integrated EHRs completely into their operation such as Nguyen Tri Phuong hospital which has been recognised as the first public facility to successful execution of EHRs. To fully realise the aim of becoming a digital health innovation hub, substantial efforts from HCMC are required to drive the development direction of the healthcare system in digital transformation.
- **Implications/Gap:** The uneven distribution of technological resources hinders the seamless integration of health information systems. Moreover, there is a notable lack of familiarity with new technologies among the local population, emphasising the need for comprehensive education and training initiatives.

#### *Technology interventions:*

- **Level of implementation:** Major hospitals in HCMC have focused on expanding the adoption of robotics-assisted surgery and wearables in their interventional healthcare procedures and monitoring patient health. After 6 years (from 2016 to 2022) of implementing robot surgery, the number of cases undergoing surgery at Binh Dan Hospital is approximately 2,000, an increase of 1.67 times. Robot-assisted surgery is most commonly applied in pelvic surgeries, primarily for cancer cases. A total of 14 diseases were treated with the support of robotic surgery, including colorectal cancer, rectal cancer, prostate cancer, kidney tumours, and reproductive tract tumours. Through revolutionising surgical practices, not only does it minimise the repercussions for surgeons, but it also reduces the risk of post-operative infections. Robot-assisted surgery has enormous potential since it enables more accurate and minimally invasive operations. Another notable case is Cho Ray Hospital, which is pioneering in implementing AI in blood cell image analysis and interpretation of pathology results using algorithms. In addition, consumer health electronics, such as the Apple iWatch and wearable contact lenses, are being strongly implemented in HCMC, which has a continuously growing market. The Ministry of Health introduces contact lenses to monitor the level of glucose in your tears instead of blood glucose. Many attempts have been made to develop glucose sensors for tears due to the enormous advantages of being non-invasive and continuous, making them an attractive potential option instead of a blood test.
- **Implications/Gap:** Insufficient funding and limited training opportunities hinder the widespread adoption of robotics in healthcare settings. Financial constraints pose a barrier to the acquisition and implementation of advanced robotic technologies. Additionally, state-owned organisations exhibit low levels of effort and attention towards research and development (R&D), further impeding the exploration and integration of cutting-edge robotics solutions. Addressing these issues, such as securing adequate funding and fostering a culture of R&D within state-owned entities, is crucial to unlocking the full potential of robotics in enhancing healthcare services in the city.

#### *Artificial Intelligence and Big Data:*

- **Level of implementation:** The shift towards technology with regards to AI and Big Data has prompted large hospitals in Ho Chi Minh City to invest in and incorporate these technologies into their diagnosis and treatment, leading to increased operational efficiency. During 2019–2023,



OUCRU worked on a project with the Hospital for Tropical Diseases and Trung Vuong Hospital in Ho Chi Minh City, which was funded by Wellcome Trust UK. The project has developed AI-based clinical decision support tools to optimise decisions around the major causes of intensive care unit admission (tetanus, dengue, sepsis, and TB) using state-of-the-art machine learning models and data from low-cost wearable devices. Evidence of this work includes published code, scientific papers, and a recently filed patent. It was selected as a case study exemplar at the Department of Health's 'Evaluate the effectiveness and orientation of specialised medical devices in HCMC'. In addition, two completely novel devices have been created for the management of patients with dengue. AI-enabled imaging tools have been developed to allow inexperienced clinicians to use bedside ultrasound in patient management. These were presented at international intensive care meetings, engineering conferences, and international publications. These tools have been validated and integrated into readily available software. In the current extension, wearable devices have been incorporated into a commercial product in collaboration with a local Vietnamese company. The feasibility of using this platform combined with AI in monitoring and diagnosis of new diseases has been shown in two cases of MPox admitted to HTD for isolation and monitoring. The system is now being further developed and extended to ICU and non-infectious disease use cases (cardiology) in Trung Vuong Hospital HCMC. The Ho Chi Minh City Eye Hospital has developed an AI software application called EyeDr for early and accurate glaucoma screening using colour papilloma photography. This technology has significantly impacted Vietnamese medicine and the industry. CerviCare AI is expected to be deployed across obstetric hospitals in Ho Chi Minh City for cervical cancer screening and early detection. RAPID AI at People's Hospital 115 has also made significant strides in stroke treatment, providing thrombolytic intervention for patients arriving after 6 hours. FPT.eHospital 2.0, which was updated in 2018, incorporates AI, Big Data analytics, cloud computing, remote patient monitoring, and mobile device integration.

- **Implications/Gap:** The inadequacy of digital infrastructure in hospitals poses a significant barrier, limiting the seamless integration of advanced technologies. Moreover, there is a prevalent lack of digital competencies among healthcare professionals, hampering the effective utilisation of AI and big data tools. To overcome these obstacles, there is a pressing need for further cooperation and exchange with worldwide medical institutions, facilitating knowledge transfer and skill development.

## Telemedicine

- **Level of implementation:** The Telemedicine programme was developed by the Ministry of Information and Communications (MIC) and the Ministry of Health (MOH) in 2020 to allow users in HCMC to access virtual medical examinations and treatments across numerous hospitals in HCMC, including Cho Ray Hospital and FV Hospital. This removes the friction of going to a hospital and sitting in a waiting room for patients while increasing the hospital's capacity to admit patients for diagnosis and treatment, which was essential during the COVID-19 pandemic. The main function of digitalising diagnosis and treatment is to significantly increase accessibility to healthcare for anyone with technological devices.
- **Implications/Gap:** Telemedicine encounters some barriers in Ho Chi Minh City as patients grapple with unfamiliarity with new procedures, hindering the seamless adoption of remote healthcare services. Compounding these issues is the low focus of investment in this field of medical service, limiting the technological advancements and resources available for widespread telemedicine implementation. Overcoming these barriers necessitates comprehensive efforts to educate and acclimatise patients, improve infrastructure, and redirect investments towards the development and integration of telemedicine to enhance healthcare accessibility in Ho Chi Minh City.

Ho Chi Minh City is focusing on enhancing digital adoption in its healthcare sector, particularly in diagnosis, treatment, and hospital management. This is crucial for the city's growth as a digital health innovation centre. However, major hospitals and state-owned organisations have not invested in R&D and training, leading to a lack of sufficient training programmes on digital health and research. This absence of funding and training opportunities impairs the city's ability to stay at the forefront of medical developments and create innovative remedies. To overcome this, Ho Chi Minh City should promote R&D

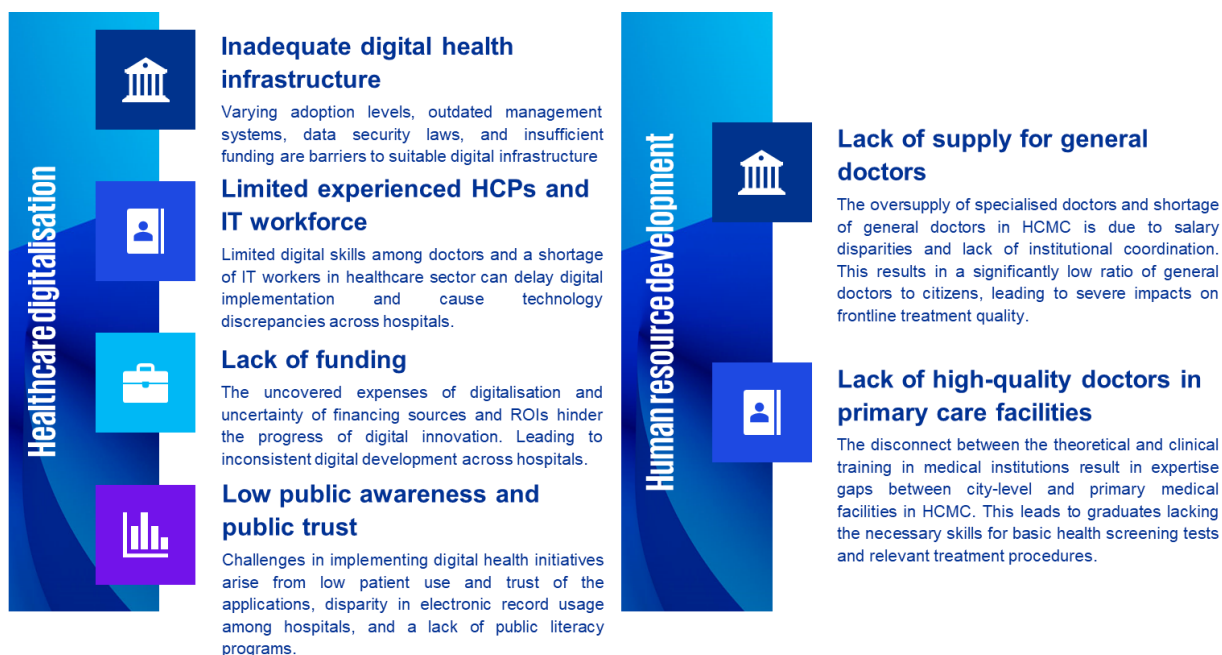
efforts in the healthcare industry to effectively utilise its digital infrastructure and human resource capabilities. Despite the deployment of these technologies being in its infancy, the trajectory is set for exponential growth due to the greater acceptability and practicality of digital technologies in healthcare.

## 1.2.4. Current and Near-term Government Initiatives

The Vietnamese government has demonstrated a strong and sustained commitment to utilising digital solutions in healthcare. The current regulatory framework has effectively laid out a solid foundation for all provinces and cities in Vietnam to foster the digitalisation of healthcare services on a national scale, including HCMC. In specific, the following legal documents, such as Circular No. 49/2017/TT-BYT on Telemedicine, Decision No. 2153/QĐ/ĐYT regarding the promotion of regulations on the establishment, use, and management of Electronic Health IDs, Circular No. 54/2017/ĐYT on criteria for Assessment of Information Technology Applications at Health Facilities, and many other related regulations, have been issued to set vital objectives and provide detailed guidance to all relevant stakeholders on the topic of improving medical human resources and healthcare digitalization.

In the near future, to accelerate the implementation progress of digital innovation in the healthcare sector, HCMC's initiatives will be majorly shaped by the issuance of three key legal documents, including Resolution No. 24/CT-TTg on Socio-economic Development and Ensuring Defence and Security in the Southeast Region by 2030, with a vision to 2045; Resolution No. 31/NQ/TW on Tasks and Orientations to Development of HCMC by 2030, with a vision to 2045; and Decision No. 748/QĐ-TTg on introducing a programme for national digital transformation by 2024 with a vision to 2030 (detailed description of the current and near-term government initiatives are located in Appendix 1.3 of this report). With the presence of these initiatives, HCMC is expected to see significant advancements in digital innovation within the healthcare sector, paving the way for improved efficiency and quality of services. These legal documents will provide a framework for the city to align its digital transformation efforts with national objectives and priorities, ensuring a cohesive approach towards modernising healthcare delivery.

## 1.2.5. Key challenges



Despite its strong investments in the city's healthcare system, Ho Chi Minh City is still facing various obstacles that impede the city's capability to accelerate as a digital innovation hub in Vietnam. For digitalization, the city is currently facing four key challenges, including **Inadequate digital infrastructure**;

**Limited experienced HCPs and IT workforce in the healthcare sector; Lack of funding; and Low public Awareness.**

**Inadequate digital infrastructure** HCMC faces significant challenges in establishing consistent technology infrastructure for widespread implementation of digital health initiatives. Variability in digital adoption levels among hospitals, ranging from successful implementation to early stages, stems from differing technology requirements tied to distinct therapeutic specializations. The absence of a consolidated central system for patients' electronic health records exacerbates the issue. Outdated hospital management systems, including the Hospital Information System (HIS) and Laboratory Information System (LIS), hinder the implementation of essential features like e-signatures and jeopardise data completeness and security. The recent enactment of Decree 13/2023/ND-CP intensifies the pressure on hospitals to upgrade data systems and invest in data security solutions. Insufficient funding, coupled with delays in administrative processes, contributes to an inadequate data infrastructure, impacting asset quality and functionality over time. For instance, the prolonged approval process has stalled the Data Security and WiFi Implementation programme in Hung Vuong Hospital for over three years.

**Limited experienced HCPs and IT workforce in the healthcare sector** Ho Chi Minh City (HCMC) grapples with implementation challenges for digital health initiatives due to a scarcity of experienced HCPs and an inadequate IT workforce. Despite a surplus of medical graduates, the digital skills of doctors are modest, with limited training emphasis in universities. This overall lack of digital proficiency among medical staff hinders city-wide implementation. In addition, the healthcare sector in HCMC faces a severe shortage of IT workers, primarily due to unclear compensation programmes, making recruitment challenging compared to more competitive offers from IT companies. As digitalization transforms HCMC's economy, IT has become an essential function for organizations. This has resulted in a higher demand for IT workers, creating better job opportunities in more lucrative industries compared to healthcare positions. The lack of experienced IT personnel significantly delays digital health implementation, creating substantial disparities in digital implementation across hospitals.

**Lack of funding** The lack of funding for digital health implementation in HCMC has significantly hindered progress across hospitals. Unable to pass digitalization and training costs directly onto service fees, HCMC hospitals must self-finance, imposing a major financial burden. The uncertainty regarding financing sources and the return on digital investments makes hospitals hesitant to accelerate digital innovation in treatment and management. The minimal presence of government funding further compounds challenges in advancing digital health development in the city.

**Low public awareness and public trust.** HCMC faces a challenge in implementing digital health initiatives due to low public awareness, hindering patient accessibility to available programs. Despite high mobile and internet penetration rates, the usage of digital health applications for medical processes and post-treatment tracking remains notably low. Inconsistencies in electronic health record usage across hospitals contribute to patient reluctance, as the records are not universally accessible in HCMC. Additionally, digital health literacy programmes predominantly target healthcare professionals, neglecting public awareness. The overall lack of awareness hampers patient access to digital health applications, making it challenging for HCMC hospitals to motivate digitalization efforts. Furthermore, the lack of public trust also hinders HCMC's capability to emerge as a digital innovation centre in the country. Concerns over data security, numerous mobile health applications, and COVID-19 scams all contribute to this issue. Additionally, patients are hesitant to use telehealth services as they are worried that practitioners may not be experienced enough and that direct consultations are more efficient. As a result, the public community may be less open to adopting digital health solutions, hampering HCMC's digital transformation efforts.

Additionally, barriers to medical education in HCMC still exist, leading to a shortage of competent doctors, especially in small medical facilities. These challenges include:

***Lack of supply for general doctors*** HCMC is confronted with an imbalanced doctor supply, marked by an abundance of specialised doctors and a scarcity of general doctors. The city excels in providing intensive therapeutic treatments, benefiting from significantly lower costs for surgeries like endoscopic and cardiology procedures (only 1/3 of the treatment cost of an international medical facility) due to the excess supply of specialised doctors. However, this surplus of specialised doctors creates a dilemma, leading to a limited supply of general doctors. At the grassroots level, HCMC struggles with a modest ratio of 2.3 general doctors per 10,000 citizens, significantly below national and Hanoi averages. This is because most newly graduated HCPs and doctors are more interested in becoming specialised doctors due to the higher benefits and salary package. The lack of communication and coordination between hospitals and medical universities exacerbates the issue, making it challenging for universities to meet the demand for general doctors. The shortage severely impacts treatment quality at the frontline, complicating primary care and potentially causing over-occupancy in HCMC hospitals. Additionally, HCMC also faces a significant challenge in terms of the limited number and uneven distribution of family physicians. Only two out of five universities (University of Medicine and Pharmacy of HCMC and Pham Ngoc Thach University) offering medical education in the city provide post-graduate programmes in Family Medicine. This shortage results in a notable disparity in treatment quality between city-level hospitals and grassroots facilities, contributing to severe overcapacity in city-level hospitals.

***Lack of high-quality doctors in primary care facilities*** There is still a substantial gap in the quantity and expertise of doctors between city-level facilities and grassroots medical facilities in HCMC. This disparity is attributed to a lack of connection between theoretical and clinical training in medical universities, resulting in numerous graduates lacking the necessary skills for basic health screening tests and relevant treatment procedures. The disconnect between theoretical and clinical training leaves medical students with limited hands-on experience, significantly impacting the overall quality of graduates in the city.



## 1.2.6. SWOT Analysis



**Strengths** Being the most populous city in Vietnam, HCMC carries many demographic, economic, and financial advantages to construct a distinct healthcare system. The foundation in digitalization capability, financial support, government initiatives, and professional medical education makes HCMC a suitable location for a health innovation centre.

**Strong digitalization capability** HCMC's potential as an innovation centre lies in its second-ranking national digitalization score of 0.7163, per the Ministry of Information and Communications. Post-COVID-19, the city's emphasis on IT applications and digital transformation has yielded innovative products, driving further development. The high digitalization rate, supported by government initiatives, signifies sustainable growth and readiness for technological advancements in healthcare. The Department of Health's commitment to enhancing digital transformation in the health sector aligns with the city's 2024 priorities. This increased digitalization in healthcare promises improved patient care, operational efficiency, and data-driven decision-making by healthcare professionals.

**The fastest-growing healthcare sector in Vietnam** In addition, financially, the implementation of new innovative technologies is backed by the government with high priority. In 2021, HCMC spent USD 89 billion on healthcare, which takes up 1.65% of the total GRDP of the city. This shows the focus and incentives of HCMC on healthcare as well as healthcare advancement. Because of its geographic location and development, HCMC acts as a reliable place for people from other provinces to get health treatment; this also encourages high spending to be invested in HCMC. Ever since the COVID-19 pandemic, some flaws in the city's health sector have been exposed. This has led to even greater priorities for investment and strengthening the health system, especially the grassroots health system.

**Support and commitment from the Department of Health** The Department of Health in Ho Chi Minh City goes beyond financial support, emphasising training and digitalization initiatives. Future plans include the implementation of "smart" digital approaches to reform health administrative procedures and the establishment of a digital health innovation hub from 2025 to 2030. This

strategic move aims to build a comprehensive health sector database, facilitating the forecasting and formulation of health strategies. The envisioned data utilisation could revolutionise healthcare, enabling telehealth to complement traditional services and offering citizens more flexible, high-quality, and easily accessible healthcare. This commitment signals the city's intent to transform into an innovative digital health centre, promising significant positive implications for Ho Chi Minh City's development as a hub for digital health.

**Advanced medical training** Ho Chi Minh City (HCMC), housing key hospitals, boasts an advanced medical training system through Hospital-School models with various affiliated universities. To stay abreast of global medical practices, these institutions engage in international collaborations, encompassing exchange programmes, joint education initiatives, and educator training with global universities. This dynamic relationship enhances education programmes by exchanging resources like library assets and lecturers. The Hospital-School model not only fosters a constantly updated curriculum to improve diagnostic and research skills but also facilitates internship programmes for medical students' post-degree, ensuring hands-on experience and producing well-prepared, high-quality doctors. This comprehensive approach contributes to the continual improvement of medical examination and treatment quality in HCMC hospitals.

**Weaknesses** Despite the strengths outlined above, there remain key challenges that hinder the development of a digital health innovation hub in HCMC.

**Lack of funding for digital health initiatives in hospitals** Establishing a digital health hub in Vietnam faces a significant impediment due to inadequate funding, hindering the implementation of government-backed initiatives. Insufficient financial support, particularly in covering integration and maintenance costs separate from service fees, leaves hospitals struggling to attain profitable margins. The resulting lack of incentives and resources impedes the effective adoption and sustenance of digital health solutions. The burden of financing falls predominantly on private enterprises, yet the government's inconsistent commitment creates market instability, making private investors reluctant to allocate funds. This funding dilemma has led to a scarcity of investment in digital health projects, seriously hampering the progress of initiatives aimed at developing a robust digital health hub in the country.

**Lack of patient awareness** Despite high digital penetration in Ho Chi Minh City (HCMC), a notable lack of awareness about digital health services poses a challenge to establishing a digital health hub. While some awareness was raised during the COVID-19 pandemic, it focused mainly on epidemic control-related applications. The majority of citizens in HCMC remain uninformed about the broader range of digital health services, resulting in subdued demand. This lack of awareness, coupled with distrust, especially among the elderly and rural residents, hinders the adoption of innovative digital healthcare solutions. The prevailing preference for traditional healthcare methods further deters hospitals from implementing digital health initiatives. The interplay of limited awareness, low demand, and public scepticism collectively acts as a significant barrier to advancing a digital health ecosystem in HCMC.

**Discrepancies and discontinuities in digital health implementation in HCMC** The outsourcing of digitalisation efforts in Ho Chi Minh City has led to a lack of a central coding language across hospitals, preventing seamless data utilisation and hindering the goal of centralising health data in a unified database. This disparity in digital infrastructure has left hospitals vulnerable to data breaches, fostering apathy towards digital health solutions among both hospitals and citizens. To address this, the government explores the use of blockchain open database technology to decentralise information ownership, but financial burdens and the need for legal developments in personal data laws pose challenges. Inadequate funding for digital health infrastructure has left computer machinery incapable of handling software complexity, impeding efficiency, and discouraging the adoption of new digital health solutions.



**Doctors are unprepared to utilise complex digital health systems** Given the ever-adapting nature of technology, HCMC doctors have largely found themselves unable to operate digital health applications, further inhibiting the development of a digital health hub in HCMC. This is because information systems accommodating healthcare data are complex, resulting in fragmented and decentralised adoption across hospital departments. As a result of this added complexity, all healthcare professionals will need to be trained, a significant hurdle given the current financial pressures mentioned previously. This underscores a fundamental weakness in establishing a robust digital health hub in Vietnam.

**Inability of the healthcare sector to train and attract IT personnel** Vietnam, including Ho Chi Minh City, faces a significant gap between the demand for skilled IT personnel and the available supply, with a shortage of nearly 200,000 IT professionals, according to the Ministry of Labor. Hospitals, constrained by low technological budgets, struggle to attract and retain qualified IT personnel for digital health initiatives. Outsourcing these tasks becomes costly and inefficient, as healthcare expertise is essential for developing applications. This reliance on external IT professionals places a strain on healthcare facilities, impacting both the quality and cost of healthcare. The incapacity to retain skilled professionals also poses challenges in keeping up with rapidly evolving IT advancements, potentially rendering existing digital health infrastructure obsolete.

**Lack of clinical research capability and support** Ho Chi Minh City faces a significant challenge in building clinical research capability due to a lack of support and infrastructure for conducting clinical trials. Only a few medical facilities and medical research institutions in Ho Chi Minh City, such as OUCRU and the University of Medicine and Pharmacy, can meet the required human or financial resources to conduct clinical research and trials. The limited clinical research capability hinders the city's ability to advance medical knowledge and develop innovative treatments for various illnesses to emerge as a regional digital innovation centre. Without significant improvements in the clinical research infrastructure and support, it will be more challenging for HCMC to position itself as a leader in medical research and development in the region.

**Opportunities** Recent improvements in technology and digitalisation, coupled with the ageing population structure and an emerging medical tourism industry, are the key attributes that will create strong market opportunities for digital health innovation in HCMC. These factors empower the expansion of digital health solutions by boosting local demand for digitalization in the healthcare sector, as well as by enhancing the current efficiency and effectiveness of the healthcare system.

**An ageing population results in a strong city's demand for healthcare services and digital health solutions.** HCMC is grappling with a rapidly ageing population, with the proportion of individuals over 60 increasing from 9.30% in 2019 to 11.03% in 2022. Factors such as low fertility, high life expectancy, and economic considerations contribute to this demographic shift. The ageing population presents a unique opportunity for the development of digital health innovation centres tailored to the needs of older adults. With an increase in disease incidence, there is a growing demand for healthcare innovation, including preventive solutions, remote monitoring, telehealth, and cognitive health solutions. The government's recognition of this need is evident in various initiatives aimed at providing innovative healthcare solutions for the elderly, creating opportunities for foreign investment in healthcare innovation in HCMC.

**Rapid growth of medical tourism** HCMC has been emerging as one of the top destinations in Vietnam for medical tourism, has provided healthcare services to 40% of total medical tourists in Vietnam, and has contributed approximately USD80 million (~40%) to the national medical tourism revenue annually. The newly added 30 medical tourism services that were introduced in HCMC in 2023 are expected to create strong positive impacts on the potential growth of digital health innovation in the city as they boost international demand for domestic healthcare services. The strong development of the medical tourism industry in HCMC presents an attractive market

opportunity to develop digital health innovation centres that can provide cutting-edge healthcare solutions for both domestic and international patients. The expansion of medical tourism also plays a critical role in encouraging the standardisation of EHR in HCMC to allow patients to store, access, and share their medical records safely and healthcare providers to collaborate, which can lead to better health outcomes.

**Emergence of smart hospital model** The rise of the smart hospital model in Vietnam has high importance for the acceleration of digital health innovation across provinces and cities, including HCMC. Smart hospitals are facilities that incorporate advanced technologies that enable the automation of processes and the integration of data. The transformation from traditional hospitals to smart hospitals that enables centralization of patient records allows hospitals to increase efficiency in patient admissions and patient treatment. The growth of smart hospitals in Ho Chi Minh City is providing an environment that is conducive to the development of digital health innovation centres. These hospitals adopt high-tech features like advanced diagnostic technologies and robotic surgery, as well as data centralization capabilities to process large amounts of data automatically. This enables hospitals to offer patients an optimal hospital stay experience, backed by real-time monitoring technologies, streamlined administrative processes, and minimal healthcare errors.

**New advancement of technology** The advent of AI, blockchain, IoT, and machine learning has spurred global digital health innovation. HCMC aspires to lead this transformation by consistently adopting innovative technologies. AI is already integral in administrative and diagnostic functions, with plans for expansion into therapeutic areas, propelling HCMC towards more integrated and patient-centric care models. Technologies like blockchain and robotics further enhance treatment efficiency by managing patient data and surgical procedures. HCMC's commitment to these advancements signifies a transformative shift in healthcare.

**Threats** The development prospect faces threats stemming from the recent enforcement of Decree No. 13/2023/NĐ-CP on personal data protection, the absence of data interoperability standards, and the security threats in the digital healthcare landscape.

**Decree on Personal Data Privacy** On April 17, 2023, the government issued Decree No. 13/2023/NĐ-CP on personal data protection ('Decree 13'). Decree 13 applies to all organisations and individuals, both domestic and foreign, involved in processing personal data in Vietnam (e.g., employees, customers, suppliers, users, or other individuals), even when the processing of personal data is conducted outside Vietnam. Hospitals, which are currently undergoing digital transformation and collecting patient information, should immediately review their internal policies and privacy management practices. This is essential to identify any misalignments between internal policies and operational activities with the requirements of Decree 13, enabling them to devise corresponding action plans.

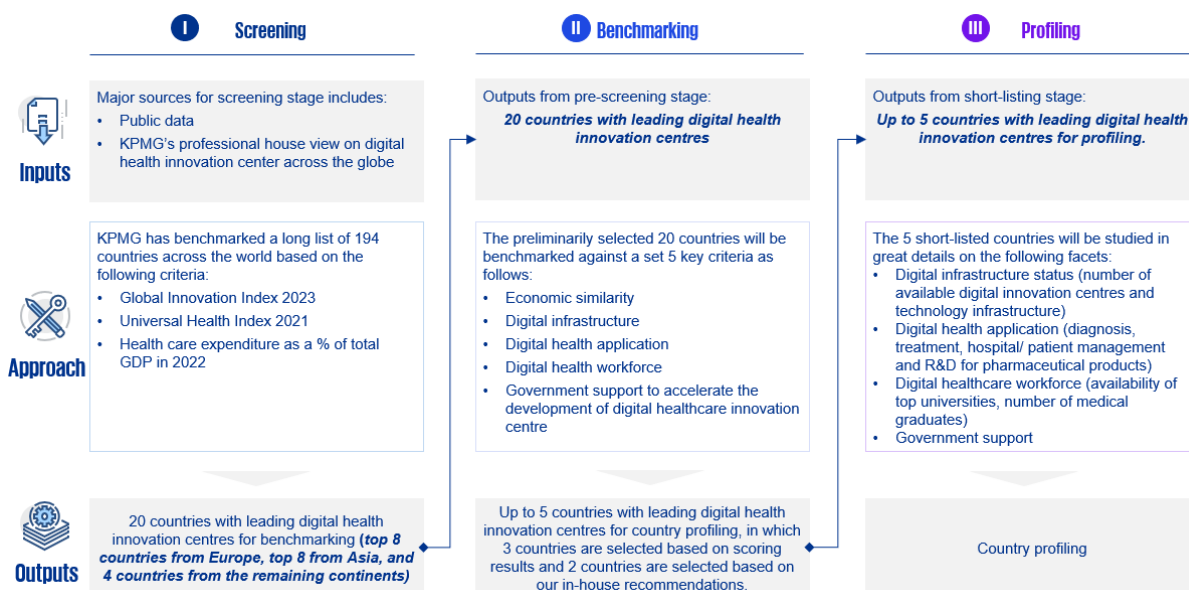
**Data Interoperability** Adoption of interoperability standards is critical for the consistent representation of data and information in health. This consistency allows for various digital health solutions to seamlessly communicate and exchange information, enabling and supporting continuity of care at all levels of the health system, regardless of the software used. However, the infrastructure in Ho Chi Minh City has not yet met the standards for data interoperability, such as HL7. With the goal of becoming a digital innovation hub in healthcare, the city should consider focusing on establishing standards for data interoperability.

**Security threats** The digital healthcare landscape faces various risks that pose significant challenges to patient safety, data security, and operational efficiency. Security threats, including unauthorised access and cyberattacks, are heightened as sensitive patient data becomes electronically stored and accessed. Security breaches, unauthorised access, and data loss can result in severe consequences, including financial losses, compromised patient records, and reputational damage. User errors and malicious actors, along with system malfunctions and

outages, further contribute to the complexity of maintaining a secure and reliable digital healthcare environment.

## 2. Case studies from leading countries

### 2.1. Methodology



We apply a systematic approach to identify leading digital health innovation centres across the world to benchmark with Ho Chi Minh City, from screening to benchmarking, transitions to detailed profiling of shortlisted countries with prime examples of the cities for digital health innovation centres. At the screening phase, KPMG employs three major criteria, including the Global Innovation Index 2023, the Universal Health Index 2021, and healthcare expenditure as a percentage of total GDP in 2022, to select **a long list of 20 countries with competitive advantages to develop a health innovation centre that consists of 8 countries from Europe, 8 countries from Asia, and 4 countries from the remaining continents**. The detailed screening score is in the table below:

| Criteria                                     | Score |      |      |      |       |       | Weighting |
|----------------------------------------------|-------|------|------|------|-------|-------|-----------|
|                                              | 0     | 1    | 2    | 3    | 4     | 5     |           |
| Global Innovation Index 2023                 | <20   | >=20 | >=30 | >=40 | >=50  | >=60  | 20%       |
| Universal Health Coverage Index 2021         | <50   | >=50 | >=60 | >=70 | >=80  | >=90  | 40%       |
| Healthcare expenditure as a % of GDP in 2022 | <3%   | >=3% | >=6% | >=9% | >=12% | >=15% | 40%       |

The second phase revolves around applying a set of quantitative and qualitative criteria to evaluate the potential of enabling a health innovation centre in a long list of 20 countries after the initial screening phase. **This set of criteria is segmented into five categories: similarity of economy, digital infrastructure, digital healthcare application, digital healthcare workforce, and government support.** The following criteria are assigned to a scorecard to determine the level of readiness for

implementing a health innovation centre, with the score scale ranging from 0 to 5, with 0 as the lowest point and 5 as the highest point each country can receive for each metric. The scorecard and following weighting are subjected to KPMG's house view on the relevance of each metric relating to medical training or education and technology adoption in their healthcare industry.

After the benchmarking exercise, **five (5) countries are selected from the long list of 20 countries** for deep-dive analyses to evaluate the degree of healthcare innovation within its healthcare system, of which **three (3) countries will be selected from the benchmarking results and the other two (2) countries are derived from KPMG's in-house recommendations.**

|                                | Criteria                                                                                | Unit   | Description                                                                                                                         | Weight |
|--------------------------------|-----------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------|--------|
| Economic Similarity            | GDP per capita                                                                          | USD    | GDP per capita in 2022. This criteria is used to prioritize countries that share high similarities with Vietnam in terms of economy | 10%    |
|                                | Number of Digital Healthcare Innovation Center                                          | Center | Number of Digital Healthcare Innovation Centers available in that country                                                           | 4%     |
| Digital Infrastructure         | Advancement of Technology Infrastructure                                                | N/A    | Advancement of Technology Infrastructure of that country, measured by Technology Infrastructure score by Cisco                      | 3%     |
|                                | Mobile phone usage                                                                      | N/A    | Mobile phone usage rate to access to Internet (as a % of total population) in 2022                                                  | 3%     |
| Digital Healthcare Application | Digital Healthcare Application in Diagnosis                                             | N/A    | Whether the country has applied digital innovation solutions in diagnosis                                                           | 9%     |
|                                | Digital Healthcare Application in Treatment                                             | N/A    | Whether the country has applied digital innovation solutions in treatment                                                           | 9%     |
|                                | Digital Healthcare Application in Hospital/ Patient Management                          | N/A    | Interoperability standards in health systems                                                                                        | 9%     |
|                                | Digital Healthcare Application in Research & Development for Pharmaceutical products    | USD    | Market value of patented medicine in 2022                                                                                           | 3%     |
| Digital Healthcare Workforce   | Availability of top medical universities                                                | N/A    | Number of medical universities in that country that were listed in Top 100 universities of QS Ranking                               | 8.8%   |
|                                | Accreditation status among top medical universities                                     | N/A    | Whether top universities in that country have global accreditation for its digital health education                                 | 12.5%  |
|                                | Number of medical graduates in 2022 (or the latest available year) (per 100,000 people) | N/A    | Number of medical graduates in 2022 (or the latest available year) (per 100,000 people)                                             | 3.8%   |
| Government Support             | Availability of National Strategy for Digital Healthcare Innovation                     | N/A    | Whether the country has a National Strategy for Digital Healthcare Innovation                                                       | 7.5%   |
|                                | Government funding for digital healthcare innovation                                    | USD    | Total amount of government funding for digital health innovation                                                                    | 10.0%  |
|                                | Availability of government initiative for digital health innovation                     | N/A    | Whether the government of that country has any initiative to foster digital health innovation                                       | 7.5%   |

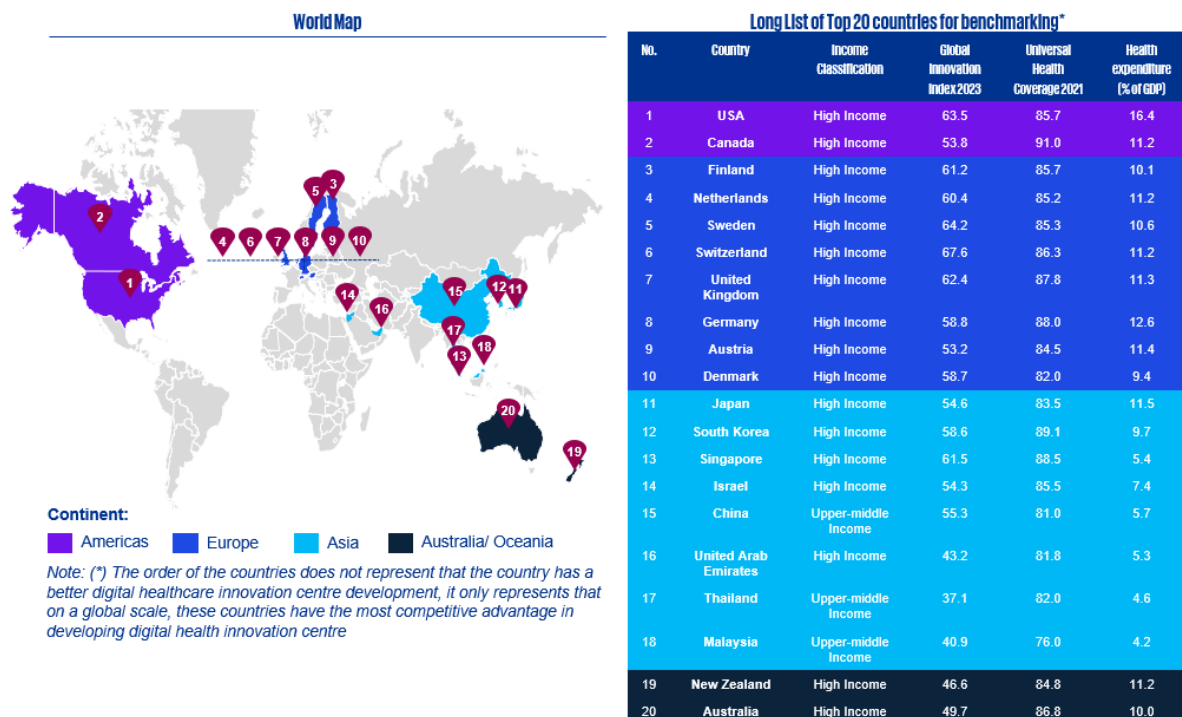
Remarks: all evaluation is subjected to available data

|                                         |                                                                                      | SCORE SCALE<br>(points assigned) |                                  |                  |                  |                  |                  |                 |
|-----------------------------------------|--------------------------------------------------------------------------------------|----------------------------------|----------------------------------|------------------|------------------|------------------|------------------|-----------------|
|                                         |                                                                                      | 0                                | 1                                | 2                | 3                | 4                | 5                |                 |
| ECONOMIC SIMILARITY & weight            |                                                                                      | 10%                              |                                  |                  |                  |                  |                  |                 |
| 1                                       | GDP per capita                                                                       | 100%                             | >=USD70,000                      | <USD70,000       | <USD60,000       | <USD50,000       | <USD40,000       | <USD30,000      |
| DIGITAL INFRASTRUCTURE & weight         |                                                                                      | 10%                              |                                  |                  |                  |                  |                  |                 |
| 2                                       | Number of Digital Healthcare Innovation Center                                       | 40%                              | <1                               | >=1              | >=2              | >=3              | >=4              | >=5             |
| 3                                       | Advancement of Technology Infrastructure                                             | 30%                              | <1                               | >=1              | -                | >=2              | -                | >=3             |
| 4                                       | Mobile phone usage                                                                   | 30%                              | <60%                             | >=60%            | >=65%            | >=70%            | >=75%            | >=80%           |
| DIGITAL HEALTHCARE APPLICATION & weight |                                                                                      | 30%                              |                                  |                  |                  |                  |                  |                 |
| 5                                       | Digital Healthcare Application in Diagnosis                                          | 30%                              | -                                | Not available    | -                | In development   | -                | Available       |
| 6                                       | Digital Healthcare Application in Treatment                                          | 30%                              | -                                | Not available    | -                | In development   | -                | Available       |
| 7                                       | Digital Healthcare Application in Hospital/ Patient Management                       | 30%                              | <1                               | >=1              | -                | >=2              | -                | >=3             |
| 8                                       | Digital Healthcare Application in Research & Development for Pharmaceutical products | 10%                              | <USD1 billion                    | >=USD1 billion   | >=USD3 billion   | >=USD5 billion   | >=USD7 billion   | >=USD10 billion |
| DIGITAL HEALTHCARE WORKFORCE & weight   |                                                                                      | 25%                              |                                  |                  |                  |                  |                  |                 |
| 9                                       | Availability of top medical universities                                             | 35%                              | <1                               | >=1              | >=3              | >=5              | >=7              | >=10            |
| 10                                      | Accreditation status among top medical universities                                  | 50%                              | -                                | Not available    | -                | In development   | -                | Available       |
| 11                                      | Number of medical graduates per 100,000 people                                       | 15%                              | <3                               | >=3              | >=6              | >=9              | >=12             | >=15            |
| GOVERNMENT SUPPORT & weight             |                                                                                      | 25%                              |                                  |                  |                  |                  |                  |                 |
| 12                                      | Availability of National Strategy for Digital Healthcare Innovation                  | 30%                              | -                                | Not available    | -                | In development   | -                | Available       |
| 13                                      | Government funding for digital healthcare innovation                                 | 40%                              | <USD100 million or Not available | >=USD100 million | >=USD250 million | >=USD500 million | >=USD750 million | >=USD1 billion  |
| 14                                      | Availability of government initiative for digital health innovation                  | 30%                              | -                                | Not available    | -                | In development   | -                | Available       |

Remarks: all evaluation is subjected to available data

## 2.2. Benchmarking Preliminary Result

Based on the screening methodology, 194 countries are compared against each other to select the top 20 countries that have the most competitive advantage in developing digital health innovation hubs in their countries. Accordingly, the top 20 selected countries are as follows:



The extensive list of 20 nations is subsequently evaluated using the methodology of benchmarking along with a scoring system. The United Kingdom, Australia, and South Korea emerged as the top-ranked countries and have been chosen for in-depth analysis. Moreover, drawing upon the healthcare market expertise of KPMG and OUCRU, Thailand and Singapore are also strongly advised to be incorporated as case studies for the HCMC digital innovation centre. The resulting scores are presented herewith:

| <div><div><div>Economic Similarity</div></div><div><div>Digital infrastructure</div><div><div>GDP per capita<br/>10%</div><div>No. of Digital Healthcare Innovation Center<br/>4%</div><div>Advancement of Technology Infrastructure<br/>3%</div><div>Mobile phone usage<br/>3%</div></div></div><div><div>Digital Healthcare Application</div><div><div>Digital Healthcare Application in Diagnosis<br/>9%</div><div>Digital Healthcare Application in Treatment<br/>9%</div><div>Digital Healthcare Application in Hospital Patient Management<br/>9%</div><div>Digital Healthcare Application in R&amp;D for Pharma products<br/>3%</div></div></div><div><div>Digital Healthcare Application</div><div><div>Availability of top medical universities<br/>6.3%</div><div>Accreditation status among top medical universities<br/>12.5%</div><div>No. of medical graduates in 2022 (per 100,000 people)<br/>6.3%</div><div>National Strategy for Digital Healthcare Innovation<br/>7.5%</div></div></div><div><div>Government support</div><div><div>Government funding for digital healthcare innovation<br/>10.0%</div><div>Government initiative for digital health innovation<br/>7.5%</div></div></div><div><div>Total score</div></div></div> |                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Country                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | United Kingdom | 3.0 | 5.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 4.0 | 5.0 | 5.0 | 5.0 | 4.6 |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Australia      | 1.0 | 3.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 4.2 |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | South Korea    | 4.0 | 1.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 2.0 | 5.0 | 2.0 | 5.0 | 4.0 | 4.1 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | China          | 5.0 | 5.0 | 0.0 | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 2.0 | 5.0 | 2.0 | 3.0 | 5.0 | 4.1 |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Japan          | 4.0 | 3.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 1.0 | 5.0 | 2.0 | 5.0 | 3.0 | 4.1 |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | USA            | 0.0 | 5.0 | 3.0 | 4.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 5.0 | 2.0 | 5.0 | 5.0 | 4.0 |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Canada         | 2.0 | 5.0 | 1.0 | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 4.0 | 5.0 | 2.0 | 5.0 | 2.0 | 4.0 |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Germany        | 3.0 | 3.0 | 1.0 | 4.0 | 5.0 | 5.0 | 1.0 | 5.0 | 2.0 | 5.0 | 4.0 | 5.0 | 5.0 | 3.9 |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Sweden         | 2.0 | 2.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 3.0 | 2.0 | 5.0 | 4.0 | 5.0 | 3.0 | 3.9 |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Austria        | 2.0 | 2.0 | 0.0 | 5.0 | 5.0 | 5.0 | 3.0 | 3.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 3.9 |



|    |                      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|----|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 11 | Austria              | 2.0 | 2.0 | 0.0 | 5.0 | 5.0 | 5.0 | 3.0 | 3.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 3.8 |
| 12 | Switzerland          | 0.0 | 3.0 | 1.0 | 5.0 | 5.0 | 5.0 | 3.0 | 4.0 | 2.0 | 5.0 | 4.0 | 5.0 | 5.0 | 5.0 | 3.8 |
| 13 | Denmark              | 1.0 | 1.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 1.0 | 1.0 | 5.0 | 5.0 | 5.0 | 1.0 | 5.0 | 3.6 |
| 14 | Malaysia             | 5.0 | 2.0 | 0.0 | 5.0 | 5.0 | 5.0 | 3.0 | 1.0 | 0.0 | 5.0 | 3.0 | 5.0 | 0.0 | 5.0 | 3.4 |
| 15 | Thailand             | 5.0 | 1.0 | 0.0 | 0.0 | 5.0 | 5.0 | 3.0 | 1.0 | 0.0 | 5.0 | 1.0 | 5.0 | 2.0 | 5.0 | 3.4 |
| 16 | Finland              | 2.0 | 2.0 | 1.0 | 4.0 | 5.0 | 5.0 | 5.0 | 1.0 | 0.0 | 5.0 | 4.0 | 5.0 | 0.0 | 5.0 | 3.3 |
| 17 | New Zealand          | 3.0 | 1.0 | 0.0 | 0.0 | 5.0 | 5.0 | 3.0 | 1.0 | 0.0 | 5.0 | 3.0 | 5.0 | 3.0 | 5.0 | 3.3 |
| 18 | United Arab Emirates | 2.0 | 5.0 | 1.0 | 5.0 | 5.0 | 5.0 | 1.0 | 1.0 | 0.0 | 5.0 | 0.0 | 5.0 | 3.0 | 5.0 | 3.3 |
| 19 | Singapore            | 0.0 | 2.0 | 1.0 | 5.0 | 5.0 | 5.0 | 3.0 | 1.0 | 1.0 | 5.0 | 2.0 | 1.0 | 5.0 | 5.0 | 3.2 |
| 20 | Israel               | 2.0 | 3.0 | 0.0 | 5.0 | 5.0 | 5.0 | 5.0 | 3.0 | 0.0 | 1.0 | 2.0 | 5.0 | 2.0 | 5.0 | 3.1 |

15 The highest potential markets for profiling

16 Our in-house recommendation for profiling

KPMG and OUCRU's perspective on the selected five countries for in-depth analysis is as follows:

#### Selected countries based on benchmarking results



United Kingdom



Australia



South Korea

#### Key rationales

- Strong healthcare innovation infrastructure with several health innovation hubs and accredited medical education
- One of the pioneer countries that foster technological applications within diagnosis and treatment
- Availability of National Strategy for digital transformation of health and social care, supporting medical education alongside public-private partnerships
- Availability of medical experts and research staff of global standing, high quality of research and data, high standards of data collection.
- Large network of medical technologies and digital health companies
- Implementation of National Digital Health Capability Action Plan to effectively build digital health capability across the health workforce and considerable government support to foster digital health initiatives
- Large patented medicine market at USD7.1 billion in 2022 with strong pharmaceutical companies such as LG Chemicals
- Has implemented strong National Strategy focusing on promoting stakeholder engagement and investing in innovation for the development of digital innovation centers
- Strong practice in medical education in Asia with 3 medical universities being listed in Top 100 QS Ranking and being accredited globally for their medical programs

#### Selected countries based on our in-house recommendations



Thailand



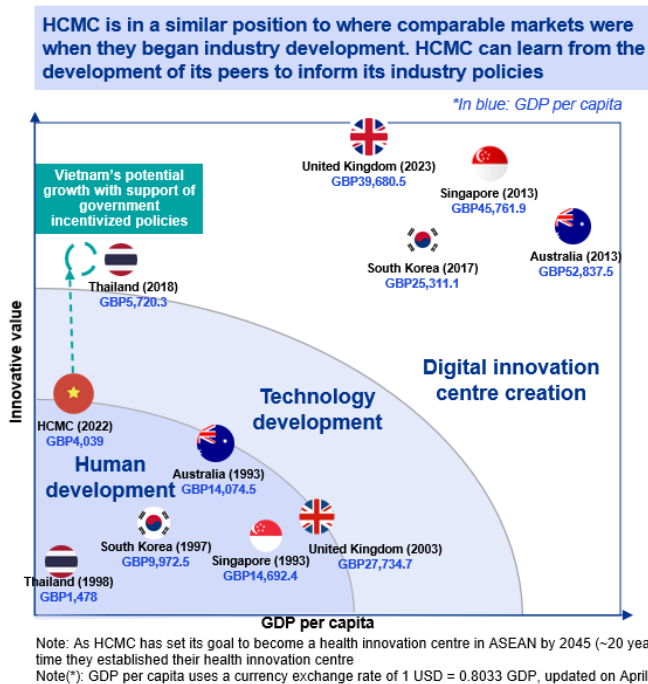
Singapore

#### Key rationales

- Share high similarities with Vietnam in terms of economy and healthcare market
- Is currently in a rapid transition for digital health and medical tourism
- Rising demand for health and health-tech services such as telehealth, remote care, digital health platform, couple with international reputation for highly skilled medical professionals.
- Government support with the execution of e-Health strategy from 2017-2026 by committed to develop adequate infrastructure and promoting collaboration between tech companies, entrepreneurs, and healthcare institutes.
- Suitable comparison for city-level digital health innovation model with small population
- Primary destination for medical tourism in Southeast Asia with advancement in treatment facilities
- Network of accredited hospitals and healthcare facilities by the Joint Commission International with prominent international healthcare and research organizations.
- Growing trajectory to invest within the fields of telemedicine, telecare, artificial intelligence, electronic health records, personal health management.
- Government support to foster innovation in healthcare through several initiatives and policies

## 2.3. Key lessons learnt from selected countries

### How other countries have been progressing with their digital innovation hub?

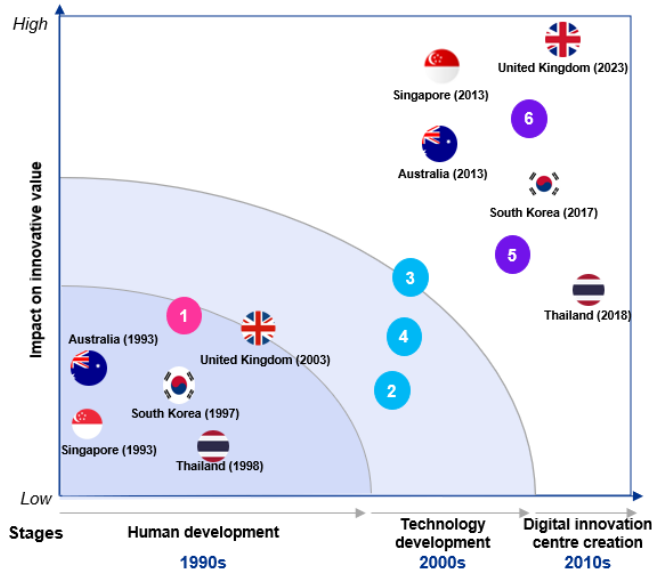


#### Stages of digital innovation centre development

- Stage 1 Human development**
- This stage focuses on **improving the quantity of supply for doctors and enhancing quality of medical education** on a national scale. Countries begin to **incorporate digital health as one of the key training topics** for HCPs to produce an industry-ready workforce.
- Stage 2 Technology development**
- At this stage, countries start making investments to **improve the quality of its healthcare infrastructure**. This includes **improving the current EHR system** to meet with global interoperability standards, **introducing AI and robotics technology** in treatment and **accelerate the production of patented drugs**.
- Stage 3 Digital innovation centre creation (IP creation)**
- In this final stage, under the digital innovation centres, **countries will start creating IPs and commercialize their digital health technologies**. This is the stage in which they will now be able to gain return and cover their initial investments (i.e. Net return exceeds investment)

### Which countries also faced the same challenges like HCMC did when they first establish their digital innovation centre?

HCMC is also facing similar barriers that the selected countries have faced when they first established their digital innovation centre. Subsequently, these are good case studies for HCMC to learn about practical solutions to accelerate innovation in healthcare



#### Common barriers faced by other countries during the establishment of their digital innovation centre

- HUMAN**
- 01 Lack of supply for doctors and for experienced IT workers in healthcare sector
- TECHNOLOGY**
- 02 Limited interoperability
- 03 Inadequate digital health infrastructure
- 04 Lack of funding
- INNOVATION**
- 05 Low public awareness/readiness
- 06 Fragmented ecosystem

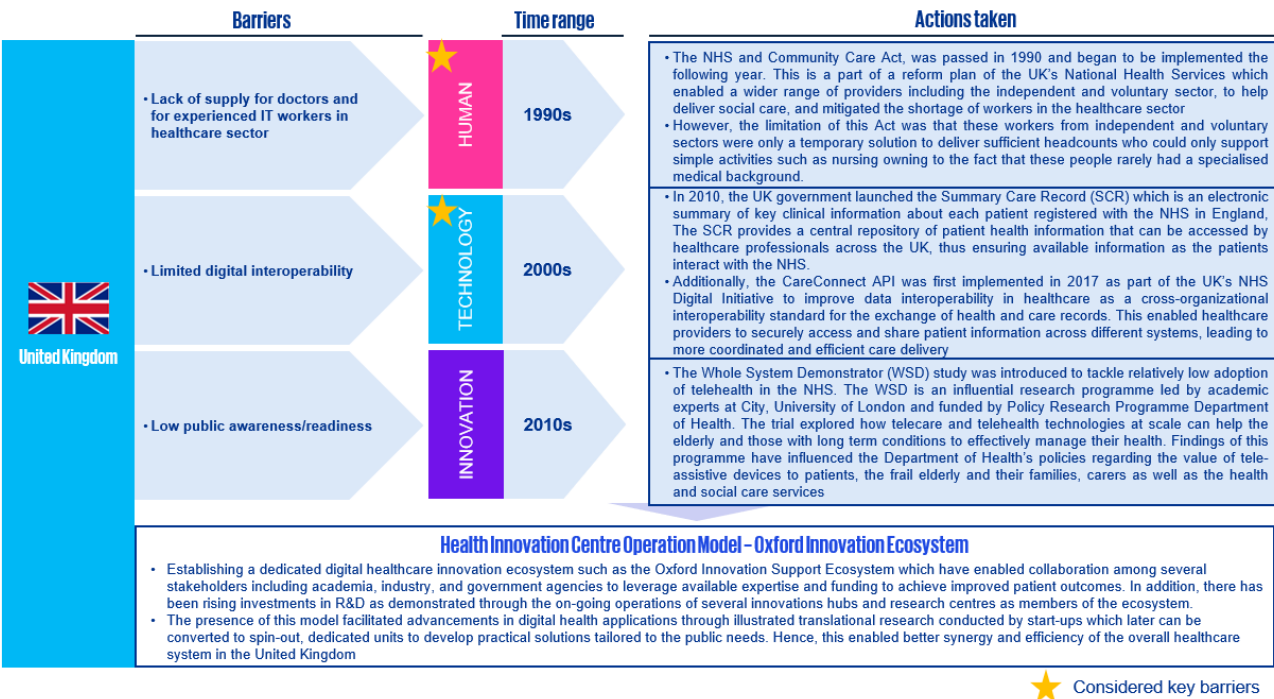
Barrier in developing digital innovation centre

Barrier that is also faced by HCMC

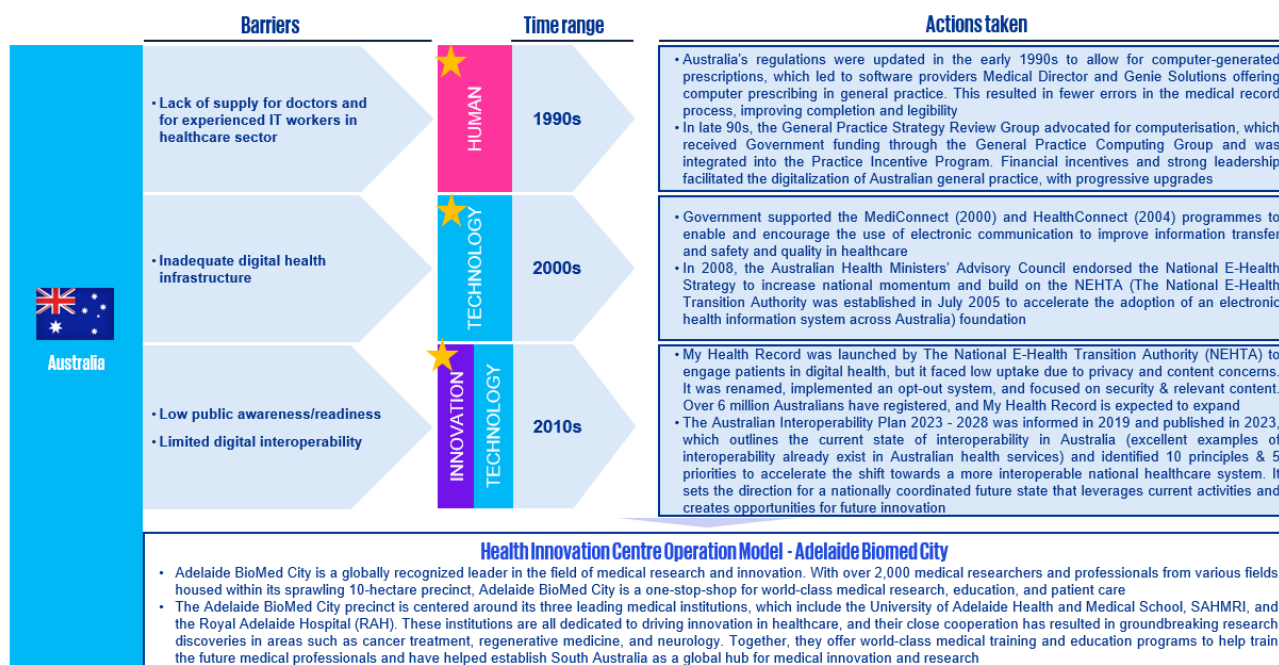
Note: The position of the barriers on the map demonstrates the level of negative impact it has on the innovative value of the digital innovation centre that country

It is imperative that HCMC learn from the best practices of nations that have established digital innovation centres in order to acquire the necessary elements for embarking on its own journey. These chosen nations should be examined to understand how they advanced through different phases of the

establishment process and the obstacles they overcame, so HCMC can gather key insights to position itself as the future digital health innovation centre in Southeast Asia. Each nation must advance through three stages in order for a digital health innovation centre to operate successfully: **human development, technology development, and digital innovation centre creation**. After an in-depth analysis of the digital health innovation progress in the five selected countries and the key barriers faced by HCMC, it was observed that each country shared similarities with HCMC in its growth trajectory. Specifically, the countries displayed parallels in terms of their approach to digital health innovation and the challenges faced, including a shortage of skilled healthcare professionals and IT personnel in the healthcare sector, inadequate digital health infrastructure, a lack of funding, and low public awareness and readiness. To address the challenges faced by these countries, each has developed and implemented its own strategic solution. Our analysis suggests that these solutions hold significant relevance for the Vietnamese market, providing valuable lessons for HCMC to advance as the leading digital innovation hub in the country.

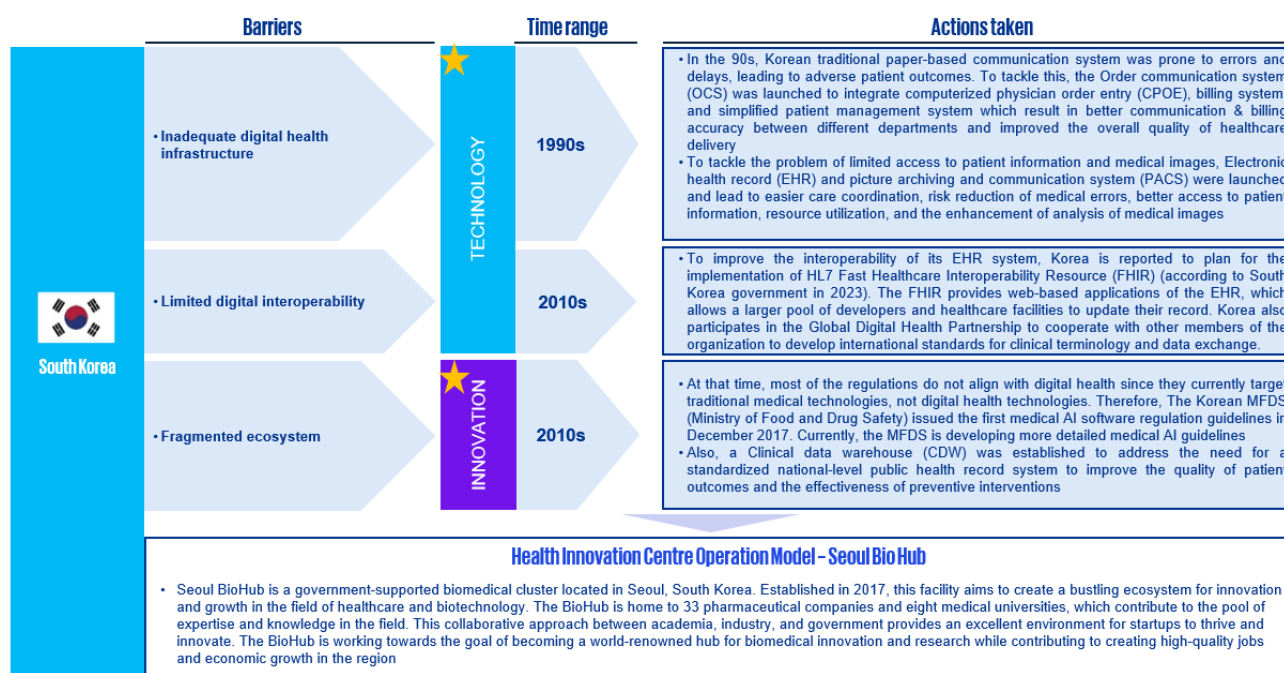


**For United Kingdom** One pivotal factor that significantly contributed to the success of the UK's digital health innovation hubs was their unified governance structure. All five hubs operate under the umbrella of a single overseeing organization which is The United Kingdom Research and Innovation - UKRI. This cohesive management approach ensures streamlined coordination, effective communication, and shared resources among the hubs, thereby maximising their collective impact and driving innovation forward in the realm of digital health. Hence, the five hubs work towards the same pre-set objectives, with each hub focusing on a specific field and factor. This centralised leadership fosters synergy, efficiency, and strategic direction, ultimately enhancing the effectiveness and success of digital health initiatives across the UK.



 Considered key barriers

**For Australia** One of the critical factors contributing to the success of Australian digital innovation hubs is their enforcement of a digital health ecosystem, allowing strong collaboration between medical facilities, medical universities, and industry players. This strategic partnership enhances the pool of human capital available for research and development within the hubs. Consequently, these innovation hubs demonstrate remarkable efficacy in securing funding and supporting innovative endeavours. By fostering strong ties with academic and medical institutions, they capitalise on diverse expertise, resources, and networks, propelling forward innovative initiatives. This synergy not only amplifies the potential for discoveries but also ensures the sustained growth and impact of digital innovation in Australia.

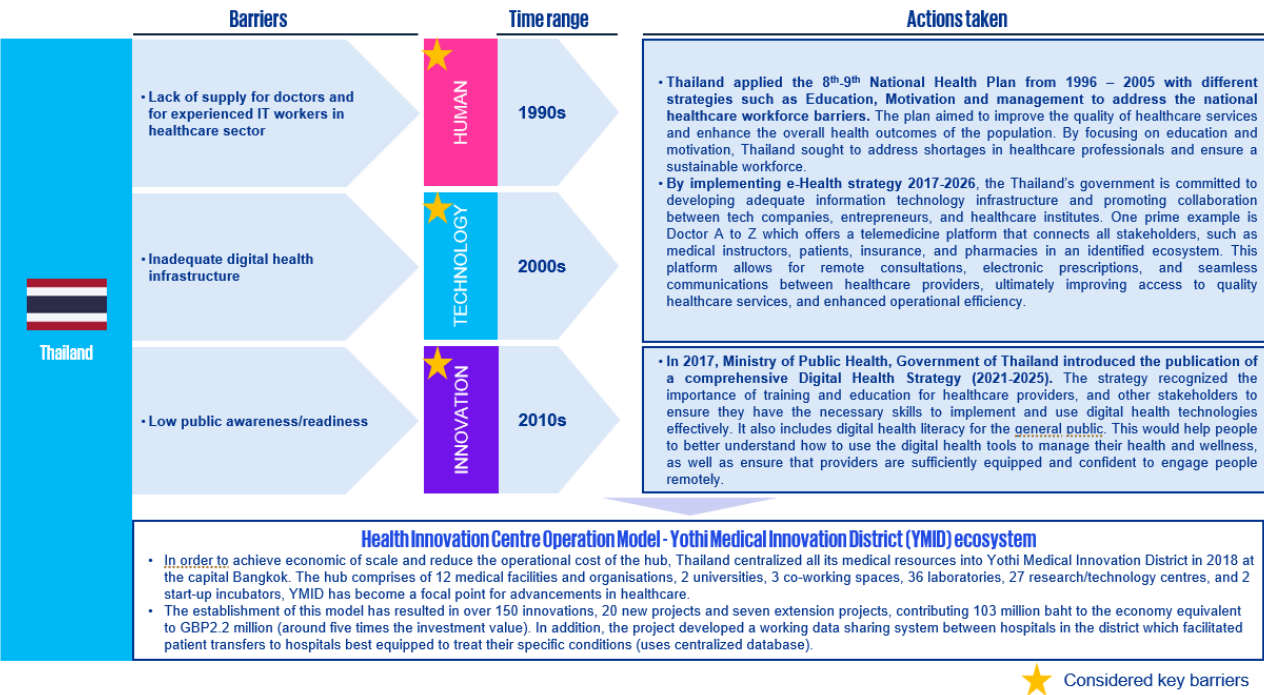


 Considered key barriers

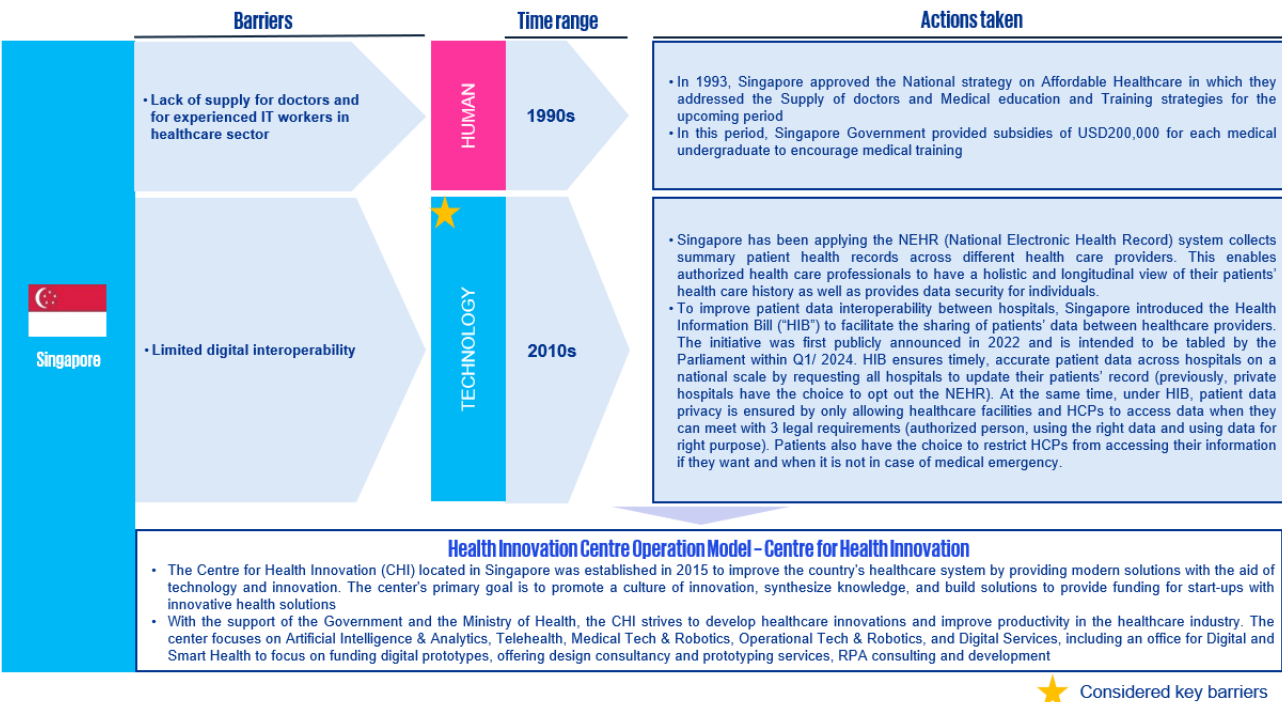
**For South Korea** One key success factor for Korea lies in its robust support for nurturing start-up companies and fostering an ecosystem conducive to new and innovative ideas. Additionally, strong collaborations with commercial partners underscore a focused emphasis on AI and technological



advancements. Korea's significant strides in technological development within the healthcare sector further distinguish it from other countries. This comprehensive approach to innovation, marked by the cultivation of start-ups, strategic partnerships, and technological advancements, positions Korea as a leader in driving forward progress and innovation in healthcare.



**For Thailand** A pivotal factor contributing to the success of Thailand's digital health innovation hub is the consolidation of its digital health ecosystem within the YMID, the country's sole innovation hub. By centralising resources in one centre rather than dispersing them, the hub maximises its impact and effectiveness. This concentration is further bolstered by ongoing collaborations with the hub, amplifying its reach and capabilities. In addition, with considerable government attention and support, the hub is able to execute a multitude of research projects successfully. This strategic alignment and focused approach not only optimise resource utilisation but also facilitates streamlined coordination and rapid advancement in digital health initiatives, keeping Thailand's health sector up to date with regional countries.





**For Singapore** Singapore's success in innovation hubs stem from its strong investment in improving the quality and quantity of medical human resources. To address the critical shortage of physicians in Singapore, the country has made considerable investments in establishing more medical universities to increase the supply of doctors. Additionally, three health clusters have been established, with the National University Health System cluster being particularly noteworthy. This cluster centres around the National University of Singapore, the top university in medical education, and aims to promote research and development in the field of innovative technology by integrating primary hospitals, polyclinics, and national specialty centres.

## 2.4. Country profiling

**Enhancing the quality of medical human resource and accelerating healthcare digitalisation are at the essence of the selected countries' digital innovation hub**

We selected five countries (the United Kingdom, Australia, South Korea, Singapore, Thailand) which either share similar economic and social characteristics to Vietnam or have proven success in establishing a digital innovation hub to benchmark against Vietnam. Key lessons learnt from the analysis of the digital innovation hub model of these countries are:



**Human resource development**



**Healthcare digitalisation**

1

**Strategic Action Plan for medical resource development and retainment**

Countries such as the United Kingdom and Thailand have enforced a Care and National Health Plan to set out specific strategies to elevate medical education and provide guidance to address national healthcare workforce barriers, including guidance on incentive schemes to retain medical workforce.

2

**Stakeholder collaboration**

All 5 countries have dedicated to improving medical training quality through domestic and international collaboration to establish globally accredited institutions for education and research. Singapore and Thailand have actively worked with leading international medical universities to attract investment in building campuses there.

3

**Financial assistance for medical students**

To encourage medical training and increase medical graduate supply, the Singaporean government has provided subsidies for medical students. In which, each medical undergraduate receives a subsidy of over USD 200,000 when pursuing a bachelor degree in the medical field.

4

**Data interoperability improvement**

All 5 selected countries have determined data interoperability as the top prioritized barrier to address to establish a digital innovation hub. To improve data interoperability, countries have invested in improving their national EHR system and upgrading them to meet with international data interoperability standard such as HL7.

5

**Public awareness and readiness improvement**

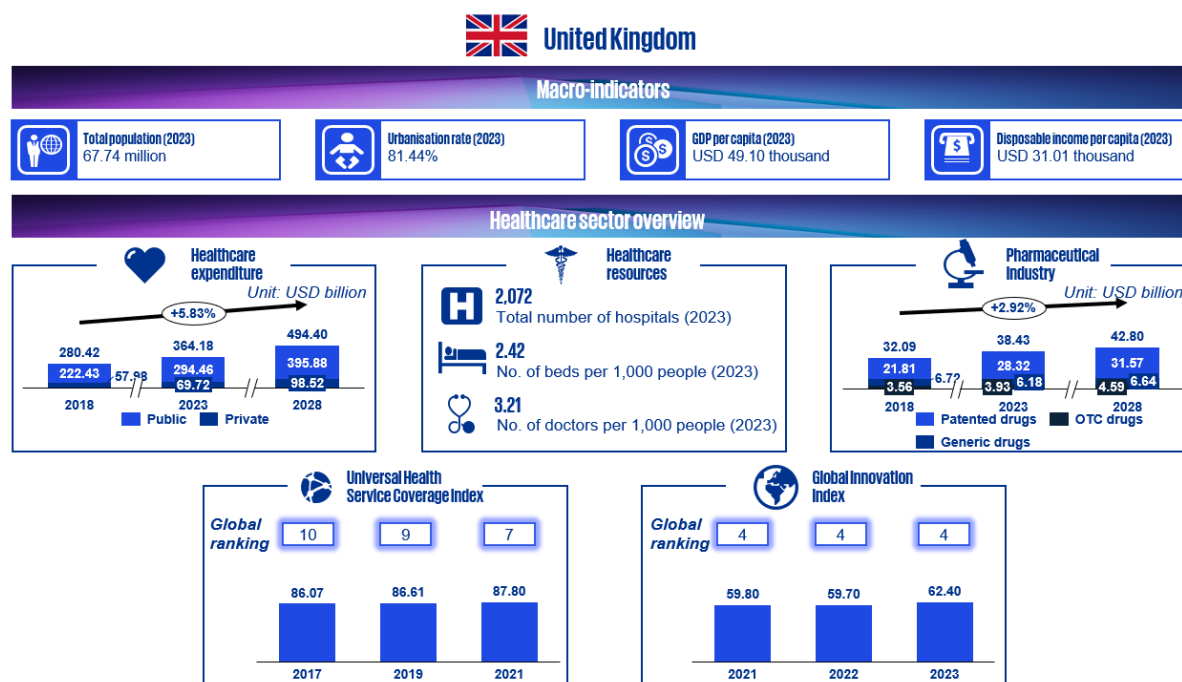
Public trust is critical for a successful roll-out of digital health initiatives, and thus, 5 selected countries have actively organised workshops, awareness programmes and promoted the usage of telehealth service to make the services more common and accessible to the public community.

6

**Digital health ecosystem**

The United Kingdom has established an ecosystem to bring scientific research into clinical treatments. Collaboration between academia, industry, and government agencies, followed by sufficient investment in R&D, and public and patient engagement, is key to the development process.

## 2.4.1. United Kingdom



Source: Fitch Solutions, EIU (number of doctors)

In 2023, the UK boasted a population of 67.74 million people, with an urbanisation rate of 81.44%, highlighting its predominantly urban lifestyle. UK's GDP per capita was USD 49.10 thousand, indicating the ability to afford new and innovative healthcare procedures. Moreover, the disposable income per capita, standing at USD 31.01 thousand, played a pivotal role in ensuring affordability and accessibility to healthcare services beyond the necessities.

From 2018 to 2028, healthcare expenditure is expected to rise from USD280.42 billion to USD494.40 billion. The UK's healthcare sector is expected to experience 5.83% CAGR growth over the same period. The government covers most healthcare expenditures for citizens, with private spending primarily on voluntary health insurance schemes. The UK had 2,072 hospitals in 2023. Despite the sufficient healthcare system, healthcare resource figures were modest compared to other developed countries, with 2.42 and 3.21 doctors and beds per 1,000 people in 2023. This could be explained by the rise in digital healthcare, such as telemedicine services. The UK pharmaceutical market experienced some fluctuations in growth, especially in the market for generic medicines, and the overall CAGR from 2018 to 2028 was 2.92%, with patented medicines dominating the market. Considering the growth in spending and focus in the healthcare sector, there is great potential for investment and expansion, specifically in health innovation.

The UK ranked 4th in the Global Innovation Index throughout the three years 2021, 2022, and 2023. The index also proved that the UK is well adapted to global technologies and any future investment. For the Universal Health Service Coverage Index, the UK was continuously improving from ranking 10th to 7th in 2017 and 2021, indicating improvement in the accessibility of health services to citizens without financial hardship. The alignment between health services and innovation further demonstrated refinement in health infrastructure and the focus of the UK's government on health innovation.

## Digital Health Innovation Hubs

The United Kingdom Research and Innovation (UKRI) and the Engineering and Physical Sciences Research Council (EPSRC) have spearheaded the establishment of five health innovation hubs aimed at revolutionising healthcare through digital technologies. These hubs serve as focal points for collaboration across academic disciplines, healthcare, and industry, fostering the development of digital health and care solutions while enhancing skills and capacity in this rapidly evolving field. One of the core focuses of these hubs is to address critical health challenges, including antimicrobial resistance, health and care outside hospitals, disease prediction, diagnosis, and intervention. By bringing together experts from various sectors, these hubs facilitate the co-creation of solutions with users, including patients, caregivers, and clinicians, ensuring that technologies are tailored to meet real-world needs. The initial investment of over USD20 million is divided into five distinct innovation hubs, launching in 2023: the Digital Health Hub for Antimicrobial Resistance (London), the South Yorkshire Digital Health Hub (Sheffield), the Northern Health Futures (North Futures) Hub (Northeast and North Cumbria (NENC) region), the King's Health Partner (KHP) Digital Health Hub (London), and the Leadership Engagement Acceleration and Partnership (LEAP) Digital Health Hub Partnership (Bristol).

The Digital Health Hub for Antimicrobial Resistance (AMR), receiving over USD 5 million in investment, focuses on antimicrobial studies supporting human health, animal health, and environmental health. Led by University College London (UCL), the hub also collaborates with other universities, such as the University of Oxford, the University of Leeds, and Prifysgol Bangor University. By working together with various medical facilities, pharmaceutical companies, and digital health technology companies, the AMR hub incorporated innovative technology into studies and research, specifically a machine learning tool that can identify hospitalised patients who need a change in antibiotic therapy in real-time and develop nanodiamond sensors that can detect resistant pathogens with incredible sensitivity.

Situated in Sheffield, the South Yorkshire Digital Health Hub has secured over USD5.4 million in investment, earmarked for the development of cutting-edge digital technologies aimed at enhancing disease diagnosis and treatment. By harnessing smartphone and sensor data in conjunction with NHS data, the hub aims to forge novel clinical tools. Led by the University of Sheffield, in collaboration with Sheffield Hallam University and other technology firms, the hub is committed to achieving predefined objectives. These objectives include assembling a diverse array of stakeholders to identify priority tools, establishing robust infrastructure for data storage and analysis, and cultivating a pipeline of ideas, projects, and products tailored for integration into the National Health Service (NHS). Furthermore, the hub is dedicated to fostering health and economic advancement within the region through initiatives such as digital skills training, networking, and knowledge exchange.

Receiving the largest funding allocation among the five hubs, totalling USD 4.2 million, the Northern Health Futures (North Futures) Hub is strategically situated in the Northeast and North Cumbria (NENC) region. Through collaborating extensively with medical universities and facilities, the hub has forged partnerships with over 50 entities, encompassing regional, national, and global companies, as well as health and care providers, local authorities, and social enterprise sector organizations. With a primary focus on leveraging Artificial Intelligence (AI) and sensor-based technologies, the hub is dedicated to advancing digital and data science training initiatives. Furthermore, the hub allocates funding for scoping research in the realm of digital health, explicitly targeting regional unmet health and care needs, health inequalities, and digital exclusion.

Located in London, the King's Health Partners (KHP) Digital Health Hub has secured over USD 2.6 million in funding dedicated to the development of digital health technologies. This innovative initiative brings together four faculties from King's College London, all King's Health Partner NHS Trusts, twenty industry participants, and an additional ten organisations and NHS Trusts from across the UK. With a keen focus on advancing data science and AI for disease prediction and diagnosis, as well as wearable devices and symptom-tracking apps, the KHP Digital Health Hub aims to create accessible solutions benefiting the entire nation. Moreover, the hub aligns its objectives with those outlined by the UKRI, particularly addressing critical issues such as antimicrobial resistance, tackling health inequalities, and addressing the unmet health needs of underserved communities.

Launched in 2023, the Leadership Engagement Acceleration and Partnership (LEAP) Digital Health Hub, located in Bristol, has received an investment of approximately USD 3.3 million. Focused on Transforming Health and Care Beyond the Hospital, Disease Prediction, Diagnosis, and Intervention, LEAP actively engages in key activities such as delivering skills and knowledge programs. The Hub's Research and Fellowship Programmes serve as platforms for piloting innovative research mechanisms and nurturing future leaders in the field. Notably, LEAP adopts a collaborative approach, with objectives co-produced by partners. This involves identifying unmet health and care needs and shaping and fostering collaborative research projects that bring together a diverse spectrum of industry, academia, patients, care takers, and healthcare professionals. LEAP embodies a holistic commitment to advancing digital health solutions and fostering impactful partnerships.

Technological development allows for innovative diagnosis; using cloud computing and artificial intelligence, patients can get more tailored diagnostics with a cost-effective tool and in a more time-efficient manner. In addition, the UK government implemented various innovative treatments with financial support from the National Health System (NHS). The innovative treatment ranges from monitoring devices to apps that allow for remote consultation and operation simulation for various diseases. The UK government also incorporates innovative hospital and patient management to ensure a well-integrated healthcare system. The management development includes the Fast Healthcare Interoperability Resources (FHIR), developed by HL7. The system allows a unified interoperability strategy across England, Scotland, Wales, and Northern Ireland, aiming to enhance health and care outcomes for all citizens. In addition, the UK government has refined the Electronic Health Record (EHR) systems, ensuring an effective cross-border information exchange between patients and researchers. As of 2022, the UK government had spent over \$28 billion on R&D for pharmaceutical products; thus, this marked the effort of the UK government to start competing with the global pharmaceutical industry.

Famously known for its prestigious education system, the UK has 12 top medical universities, according to the QS world ranking. Hence, the universities are accredited by the General Medical Council (GMC). To guarantee that strict standards are maintained, the GMC oversees every phase of medical education. The GMC does this by making sure that all medical education and training takes into account the requirements of trainees, patients, medical students, and the health system as a whole. The number of medical graduates in the UK falls below average compared to those in other developed countries, at 13.1 per 100,000 people. One possible reason for the shortage of medical graduates is the rigid requirements of the NHS. However, the UK government has been continuously expanding the medical school's capacity since 2020 and encouraging international medical students to join the workforce in the UK, avoiding a doctors' shortage.

The UK government also pays close attention to health innovation with both financial and technological support. With the purpose of system reformation and laying a foundation for the digital future, the Department of Health and Social Care (DHSC) and NHS England (NHSE) have made the digital transformation of health and social care a high priority by launching and encouraging the use of the NHS App. In addition, the UK government emphasises the importance of healthcare innovation through investments in various projects, with the amount accumulated from 2017 to 2022 reaching over USD 3 billion. The field of investments includes AI technologies to speed up treatment, electronic health record systems, and the NHS App for remote consultation. Hence, the UK government also set out clear plans for digital transformation and ensured the safe use of data supporting healthcare. Also, the plan for digital healthcare includes making sure the public is engaged and empowered for equal distribution. Overall, with clear plans and a well-supported fund for healthcare digitalization, the UK government is at a well-established standpoint with a stable and promising future for sustainable development.

## **The Oxford Innovation Support Ecosystem**

The Oxford support ecosystem for innovation is built upon a complex network of stakeholders from diverse backgrounds, including academia, industry, government, and local patients. These entities work in collaboration to foster their shared commitment to healthcare innovation and better care for patients. The ecosystem consists of four stages with numerous supporters, namely, but not limited to, the University of Oxford, the Oxford Biomedical Research Centre (BRC), Oxford University Innovation, and





Oxford Science Enterprises (OSE). Focusing on facilitating resources to bring scientific discoveries to clinical trials, the collaborative approach established throughout the Oxford ecosystem has been the key driver of health-related innovation in the UK. By working in alliances, researchers and industry have developed solutions to tackle challenges that arise from the evolution of society. The ecosystem has supported a record of start-ups and spinouts to commercialise their scientific findings, contributing significantly to healthcare innovation and the economy in the UK.

The Oxford Biomedical Research Centre (BRC) starts the first stage of the ecosystem with the purpose of providing a world-class environment for transforming scientific innovation into potential new treatments and medical technologies, quickly benefiting patients and improving the delivery of NHS care. Established in partnership between the Oxford University Hospitals (OUH) NHS Foundation Trust and the University of Oxford, the combination of university research expertise and the Trust's clinical skills has opened up clinical benefits for patients, strengthening the UK's position as a global leader in healthcare research. Since the Oxford BRC's establishment in 2007, over 4,600 research projects have been completed, and more than 6,900 peer-reviewed papers have been published. The Centre has also acquired GBP1.6 billion in external funding, created more than 600 patents, and established 27 spinouts, contributing significantly to the digitalisation of the UK and the country's economy as a whole. Numerous stakeholders have forged close collaboration to further expand the BRC research into an ecosystem for innovation support, taking advantage of available resources to create productivity spillover impacts throughout the economy. The Centre conducts pioneering research in various areas of healthcare, ranging from oncology, genomics, vaccines, diabetes, cardiovascular diseases, and microbiology, with the highlight being the research development of the Oxford/AstraZeneca vaccine and the RECOVERY treatment for severe COVID-19 patients during the pandemic. The success of BRC research has been achieved through local and national collaborations. In addition to establishing partnerships between UK universities and NHS trusts, researchers work closely with local patients and members of the public from various backgrounds to gain valuable insights into the actual needs and challenges faced by patients. With sufficient funding from NIHR and external organisations, the Oxford BRC has enhanced its research by fostering alliances with industry partners in the next stage, including major pharmaceutical companies, such as Novo Nordisk and Janssen, and Small and Medium Enterprises (SMEs). The Business Partnerships Office and Translational Research Office at the University of Oxford play a crucial role in supporting the Centre in forming long-term partnerships with the industry. These offices have utilised networking events, industry connections, and other resources to create sustainable relationships between the Oxford BRC and industry players.

The strategic partnership plan of the Oxford BRC has mapped the second stage of the Oxford Innovation Ecosystem, aiming to enhance the research environment and boost the deployment of clinical innovations. The expansion to work collaboratively with industry partners provides further financial support to the Centre to develop and fund research initiatives, accelerating the process of bringing scientific discoveries to clinical trials. In addition, the relationship with industry firms gives the Oxford BRC access to specialised human capital and advanced technology resources, opening up opportunities for researchers at the Centre to discover new areas of work. Given the existing commercialisation resources and established usage networks, industry partners are essential for the BRC to promote the deployment of new healthcare treatments. The Oxford BRC has worked in partnerships with a record number of companies in the industry, including multinational firms and SMEs, yet the Centre's partnership with Janssen has been significantly beneficial to both parties' scientific development. The Cartography project was launched in 2021 by the University of Oxford and Janssen Biotech, Inc., one of the Janssen Pharmaceutical Companies of Johnson & Johnson, with the aim of creating a cellular map of genes and proteins across multiple immune-mediated inflammatory disorders (IMiDs). The project plans to employ the most recent molecular and cellular multi-omics analysis platforms and computational methods to provide insights for target selection and precision medicine for inflammatory disease indications of the intestine, joint, and skin where options for therapeutic intervention are limited. In 2022, the project has been expanded to cover a range of many other health-related areas, namely disease, vaccines, oncology, and neuroscience. Both stakeholders have decided to extend the ground-breaking research work over the following three years. In addition to Janssen, Oxford's relationship with Novo Nordisk is one of the most important strategic alliances due to its significant benefits to the Oxford ecosystem. In 2017, the University of Oxford and Novo Nordisk joined hands to advance type 2 diabetes research, enabling



scientists from both sides to work closely towards the goal of creating innovative medicines for diabetic patients. The new Novo Nordisk Research Centre Oxford (NNRCO), invested by Novo Nordisk as part of the collaboration, is situated in the same building as the University of Oxford BioEscalator on the Old Road Campus. Novo Nordisk also committed to investing GBP115 million over a 10-year timeframe to employ up to 100 Novo Nordisk researchers for NNRCO. The industry alliances with companies have enabled Oxford to utilise additional resources and jointly open new facilities, promoting translational support and expanding the innovation ecosystem.

Leveraging the network and the infrastructure created through industry partnerships, the third stage in the Oxford ecosystem provides translational and community support for digital adoption via innovation hubs. The involvement of numerous stakeholders, including, but not limited to, NHS Trusts, academic institutions, professionals, researchers, digital developers, patients, and investors, is crucial to enabling the third stage to happen. Founded in 2016, TheHill is a catalyst for innovation embedded within the Oxford University Hospitals NHS Foundation Trust, with the objective of building a community that facilitates the effective adoption of digital innovation across NHS care facilities. Building upon industry partnerships, The Hill offers a wide range of services and programmes to support companies, especially SMEs, in launching their innovations into the market. The Hill creates connections with patients, staff, digital designers, researchers, and business investors to foster a thriving ecosystem, bringing meaningful benefits to all parties. The organisation receives funding for its programmes and activities mainly through OUH, grants, sponsorships, partnerships with external stakeholders, and fee-for-service work. In 2018, the BioEscalator was established as Oxford University's Biotech incubator, offering lab space and entrepreneurial support for high-potential start-ups in biosciences. Sharing the same building with NNRCO on the Old Road Campus, the BioEscalator is designed to provide flexible and shared facilities for early-stage businesses to conduct their work on cutting-edge diagnosis, therapeutics, and platform technologies. The centre is one of four innovation hubs in Oxfordshire, backed by the government's City Deal, and was inaugurated by Baroness Nicola Blackwood of North Oxford, Parliamentary Under Secretary of State for Innovation. The development of innovation centres has been jointly supported by public and private stakeholders, making use of existing resources and networks to create an ideal environment for commercialisation and spinouts.

The translational support sets the foundation for spinouts and IP licensing, the last stage in the Oxford ecosystem, bringing practical benefits to patients across the UK. Start-up researchers can take advantage of the mentorship, knowledge transfer expertise, and access to advanced technology and infrastructure provided by innovation hubs in stage 3 to foster the launch of spinouts. The University of Oxford has established innovation subsidiaries for decades, contributing to the effort of commercialising scientific research and intellectual property. Oxford leverages abundant resources and investments to support spinouts in the innovation ecosystem, resulting in the creation of 205 spinouts since 2011. Oxford University Innovation (OUI) was established in 1997 as a wholly owned subsidiary of the University of Oxford with the initial purpose of licensing IP and spinning out academic research into companies. It has expanded the business to provide support and funding for start-ups, as well as partnerships with industry and investors. Oxford spinouts in 2022 successfully raised GBP956 million from external investment, accounting for nearly 45% of the total GBP2.13 billion investment across the UK. These achievements have placed Oxford in a leading position in spinout creation, demonstrating the positive impacts generated by the Oxford Innovation Ecosystem. In addition to spinout support, OUI oversees a portfolio of over 2,000 intellectual properties and negotiates for the licensing of hundreds of technologies every year. The majority of partners are start-ups and SMEs, creating opportunities for small, high-potential companies to access world-class innovations. In 2015, Oxford Science Enterprises (OSE) was rolled out in partnership with the University of Oxford, playing a pivotal role in fostering the Oxford ecosystem through spinout funding. Having invested in 106 deals amounting to a total of GBP1.45 billion, OSE stands unparalleled as a top investor in UK spinouts by value. OSE also actively engages in seed-stage investment, making 63 deals worth £376 million. The engagement of the university and its subsidiaries, combined with spinout researchers and investors, has significantly contributed to the growth of the Oxford ecosystem, advancing the translation of scientific research into practical technologies.

The examination of the Oxford Innovation Ecosystem has suggested invaluable learning insights for Vietnam's pathway to digital innovation. First, collaboration between academia, industry, and government

agencies has been a critical driver of the success of the Oxford Innovation Ecosystem. Bringing together diverse stakeholders has leveraged available expertise and funding to achieve the ultimate goal of improving patient outcomes. Second, investment in R&D, demonstrated through the establishment of innovation hubs and research centres, supports ongoing development and innovation. Last but not least, public engagement and patient involvement throughout the digital innovation process are crucial to building practical and efficient technologies that can reflect the needs of the public. By applying the learning points from the Oxford Innovation Ecosystem, Vietnam can leverage and facilitate available resources to adopt effective innovations that benefit social needs and promote economic growth.

### **Funding models that the NHS has rolled out with partnerships from the private sector:**

**PF2, previously known as the Private Finance Initiative (PFI)**, as a form of public-private partnership (PPP), was introduced in the United Kingdom in 1992 and attempted to use methods and practices of project finance for public sector infrastructure projects, specifically for the social sector. In 2021, PFI was replaced with PF2 in response to concerns about value for money, as they provide greater transparency about the financial returns of project companies. As of March 31, 2023, there were 176 PFI projects, a total of 669 projects that focus on hospitals, acute health, and social care, which accounts for around a third with a total capital value of GBP14.1 billion across the portfolio. This initiative was expected to offer better value for money through a long-term focus on whole-life costs, risk management expertise, and greater certainty for the public sector that services will be delivered to the specified standard. In a typical PFI project, the private sector designs, builds, finances, and operates facilities based on specifications of outputs that a concerned public sector department or authority has determined. The structure of a typical PFI is as follows: The contract or agreement is of a long-term nature (around 25 to 30 years) and is signed between the public sector department (or client) and a Special Purpose Vehicle (SPV), which is owned by a private sector consortium, to design, build, finance, and manage a capital project. The SPV then subcontracts various components of the PFI project, including construction and operation activities. The SPV usually opts for a debt-heavy capital structure indicated by a high debt-to-equity ratio<sup>1</sup>, which would minimise the weighted average cost of capital to the public sector. Once the construction is completed and the services commence, the public sector client makes regular payments called “unitary charges” to the consortium. Upon the expiration of the contract, the asset created will be owned by the public sector. A remarkable case study of an ongoing project is the Barts and the Royal London Hospitals, which account for approximately GBP1.1 billion. This project will provide a total of 990 beds in two hospital sites, including the Royal London Hospital in East London, Britain’s most prominent new hospital, which will bring together London’s leading trauma centre and St. Bartholomew’s Hospital in the city of London, which will become a Cancer and Cardiac Centre of Excellence, which witnessed the participation of the Capital Hospitals consortium, which comprises Skanska, Innisfree, and Equion. However, in 2018, the government cancelled the practice of PFI and PF2 for new projects as they were considered inflexible, overly complex, and posed a significant fiscal risk to the government.

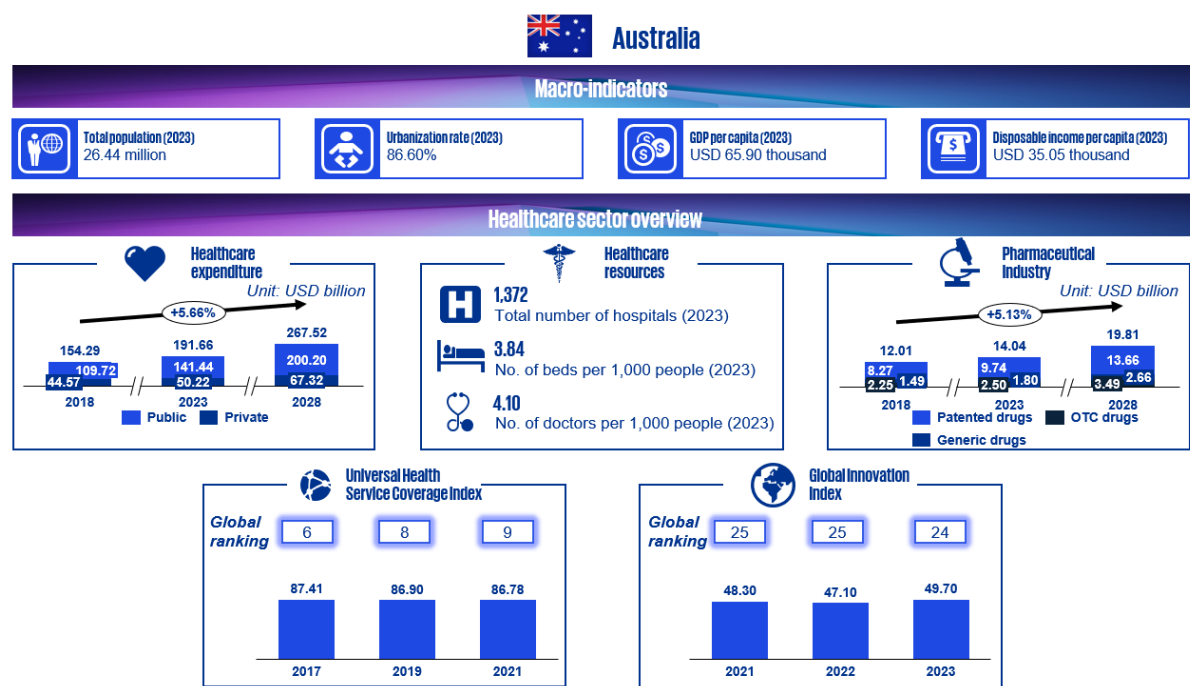
Another common model that has been adopted by the NHS and the private sector is joint ventures (JV), where two or more organisations form a new structure with shared equity and governance to provide services with the aim of leveraging economies of scale and eliminating diseconomies of scope in trusts unable to generate sufficient volumes of services. Two common forms of joint ventures are corporate joint ventures, which involve establishing a separate legal entity in a Special Purpose Vehicle (SPV) with shared risk, and contractual joint ventures, where the assets can be owned by one single organisation that takes on all the associated risk. Potential benefits of adopting this model include the ability to separate the financial activity of the JV from the financial activity of the partner trusts, enable the JV to reinvest surplus generated back into the JV company, reinvestment can be used to improve clinical standards or allow the execution of strategic expansion, JV with the independent sector can provide capital to drive service improvement, and FT-Foundation Trusts have the power to raise capital on the markets. One example of successfully implementing this model is Viapath LLP, which is a joint venture between Guy’s and St. Thomas’s NHS FT, King’s College Hospital NHS FT, and Serco to drive innovation and modernisation in pathology services. One limitation of establishing the joint venture model between the

<sup>1</sup>: The SPV raises the finance for the project, and this is a mix of debt and equity, with debt constituting the higher share of 80 to 95% and the remaining equity. The most typically adopted ratio of debt-to-equity for PFI projects was 9 to 1.

NHS and the private sector is that joint ventures involve sharing both profits and risks. Suppose a project fails or is not as profitable as expected. In that case, the opportunity cost of resources that could have been spent directly on healthcare might be drained.

In addition, **the NHS has created contracts with Integrated Care Providers, which aim to bring together a number of service providers under one umbrella.** This umbrella organisation will take responsibility for the cost and quality of care for a defined population of up to 500,000 within a particular area within an agreed-upon budget. The services involved will vary from one ICP to another. Still, potentially, ICPs can deliver a combination of primary (GP), secondary (acute or hospital), community, and other healthcare services—all under one contract. This integrated approach is intended to improve coordination and efficiency in healthcare delivery. By pooling resources and streamlining services, ICPs can also help reduce costs and eliminate duplication of efforts within the healthcare system. An instance of this partnership form is Northumbria Healthcare NHS Foundation Trust, which was one of the first ICP contracts in the United Kingdom. The model integrates hospitals, GP facilities, community health, mental health, and social care services, focusing on delivering preventative and proactive care to the population. A possible shortcoming that has been encountered during the implementation of this model is that in the event that an ICP fails to deliver services or experiences financial distress, this may cause disruptions in the continuity of care for patients.

## 2.4.2. Australia



Source: Fitch Solutions, EIU (number of doctors)

As of 2023, Australia is home to a population of 26.44 million, a majority of whom reside in residential areas, as noted by the country's urbanisation rate of 86.60%. Australia is a high-income nation, boasting a GDP per capita of USD 65.90 thousand and a disposable income per capita of USD 35.05 thousand. In particular, the synthesis of an urban populace, elevated levels of disposable incomes, and a service-dominated economic backdrop provides particularly fertile ground for the establishment and flourishing of a digital health hub.

Australia's steadfast commitment to universal healthcare is underscored by significant healthcare spending, projected to grow at a CAGR of 5.66% from 2018 to 2028, reaching USD 267.52 billion. This financial commitment sustains a robust healthcare infrastructure, encompassing 1,372 hospitals, 4.10 doctors per 1,000 people, and 3.84 hospital beds per 1,000 people, laying a solid foundation for the

seamless integration of digital health solutions. Furthermore, Australia's pharmaceutical industry is expecting similar degrees of growth, projected at a CAGR of 5.13% in the period of 2018–2028. Overall, this growth indicates increased demand for healthcare services, which can be attributed to Australia's population, presenting a unique market opportunity for the implementation of digital health solutions able to accommodate this heightened demand.

Despite this increased spending, Australia has, in recent years, lagged in expanding its healthcare coverage, as evidenced by its three-place drop in the Universal Service Coverage Index from 2017 to 2021. Conversely, Australia's innovation index has climbed in the last three years. Despite recent challenges and a dip in coverage, Australia's upward trajectory in innovation indicates a dynamic scenario positioning Australia as a promising market for the continual development and implementation of digital health solutions.

## Digital Health Innovation Hubs

Three prominent health innovation hubs located in Australia are the Digital Health Cooperative Research Centre (DHCRC), Adelaide BioMed City, and the Translational Research Institute (TRI). These hubs serve as catalysts for advancing healthcare through research, collaboration, and the translation of scientific discoveries into practical applications for better patient outcomes.

Launched in 2018 in Sydney, the Digital Health Cooperative Research Centre (DHCRC) has garnered a substantial investment of USD 110 million from the Commonwealth and universities for the period 2018–2025. DHCRC is dedicated to advancing healthcare delivery, particularly in aged care and all therapeutic areas, through digital health solutions. Utilising data-driven healthcare approaches and digital systems, DHCRC aims to enhance diagnosis and treatment by leveraging patient information and trends. Key activities include conducting research into healthcare issues, facilitating collaborative research, financing digital healthcare start-ups, and fostering academic leadership in the digital health landscape. Notable achievements include investing in education and capacity-building initiatives, signing R&D engagement agreements, and sponsoring PhD and Master students. With over 60 research projects underway or completed, the DHCRC continues to drive innovation and improve healthcare outcomes in Australia.

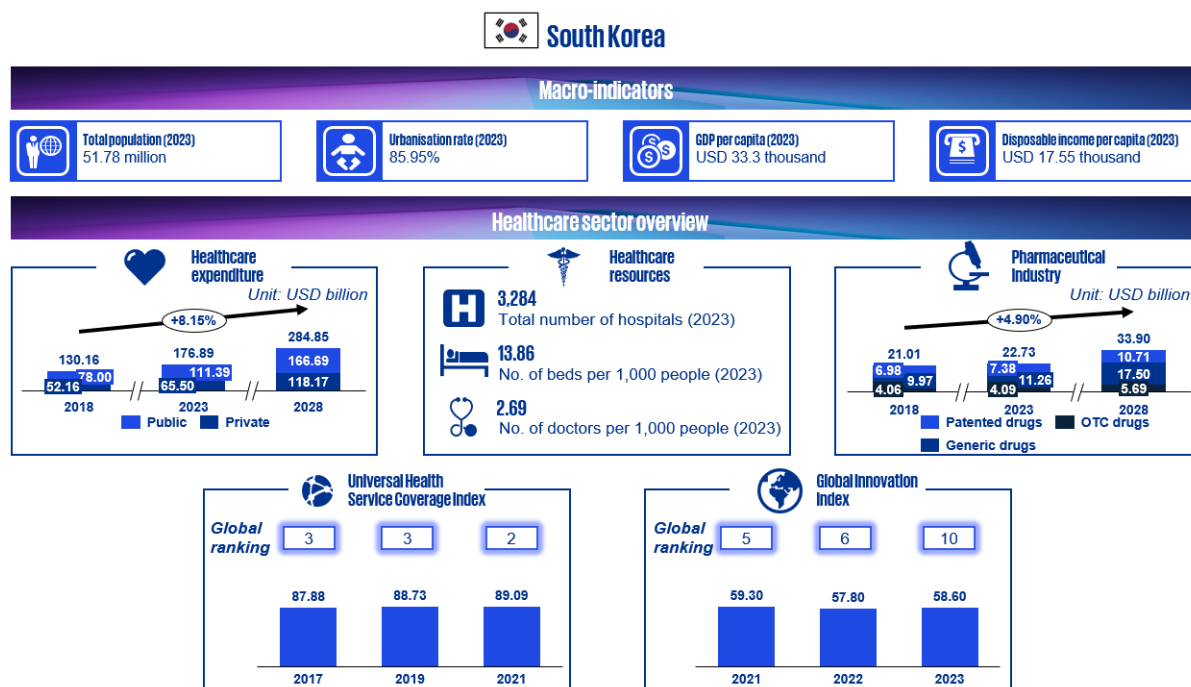
Adelaide BioMed City, launched in 2022 in Perth, has received an impressive investment of over USD 3.8 billion. Supported by the Australian federal government's reimbursement programme for pharmaceutical companies, the hub boasts cutting-edge infrastructure and facilities for medical research and innovation. Its therapeutic coverage includes specialist equipment for assessing brain function, body composition, vascular health, physical activity, fitness, cognition, and mood at the University of South Australia Clinical Trial Facility, while the New Royal Adelaide Hospital is oriented towards areas including anaesthesia, surgery, cancer, gynaecology, intensive care, and other diseases. Being a pharmaceutical-oriented hub, Adelaide BioMed City collaborates with over 40 pharmaceutical firms and other medical facilities and universities. The hub's technology focus encompasses AI, machine learning, and cloud computing. Key activities include offering a database of funding opportunities to streamline clinical testing and research, along with various activities such as providing expert advice and mentoring on one-on-one consultations, networking opportunities, bespoke roundtables, and knowledge sharing. With approximately 2000 medical researchers, Adelaide BioMed City is a hub for research, education, and commercialization. Noteworthy achievements include the upcoming Australian Bragg Centre for Proton Therapy and Research, set to house Australia's first proton therapy unit. The hub's mixed-use infrastructure fosters collaboration among researchers, clinicians, students, entrepreneurs, and industry leaders, driving innovation and knowledge transfer in the healthcare sector.

Established in 2013 in Brisbane, the Translational Research Institute (TRI) has been a beacon of innovation, with a significant investment of USD 50 million with the participation of two universities, the University of Queensland Frazer Institute and Medical School and the Queensland University of Technology, together with two medical facilities. Supported by various government initiatives, including USD 20 million from the 'Industry Partnership Programme' and funding for ageing and aged care research, TRI stands at the forefront of medical advancement. Its therapeutic areas cover a wide range, from cancer and dermatology to immunology and trauma. Embracing cutting-edge technology like AI, TRI



focuses on translating research breakthroughs into clinical practice, offering research facilities, clinician links, and education programs. Notable achievements in 2021 include 45 researcher awards and 690 research publications, underscoring TRI's commitment to knowledge dissemination and scientific excellence. With its dedication to translating research into tangible outcomes, TRI continues to be a driving force in healthcare innovation.

## 2.4.3. South Korea



Source: Fitch Solutions, EIU (number of doctors)

Korea faced a population decline, with a population of 51.78 million in 2023, and Korea's fertility rate trend has become more and more extreme as time has progressed. Even though the ageing population might have an impact on Korea's economic outlook, this forecasted an increase in demand for innovative health solutions. Despite the ageing population, Korea's urbanisation rate is continuously increasing to 85.95% in 2023, with USD 33.30 thousand and USD 17.55 thousand in GDP per capita and disposable income per capita, respectively. This indicates a high possibility for health coverage as well as an evenly distributed distribution of technology usage in Korea.

The gap between public and private spending in Korea was not too significant. This is because the Korean government does not fully cover medical fees for citizens; hence, the rising trend in cosmetic surgery in Korea also contributed to the high private healthcare expenditure. In 2023, there were only 2.69 doctors per 1,000 people. In contrast, there were 3,284 hospitals and 13.86 beds per 1,000 people in the same year, indicating an efficient and highly automated healthcare system in Korea. The pharmaceutical industry experienced CAGR growth of 4.90% from 2018 to 2028, with generic drugs maintaining the highest focus in the market. In contrast, the most significant growth was observed in the market for patented drugs.

Despite the rank of 5th, 6th, and 10th in 2021, 2022, and 2023 on the global innovation index, Korea's ranking on the Universal Health Service Coverage Index in 2017, 2019, and 2021 was impressive, with a 3rd rank in the first two years and a 2nd in 2021. This showed both the technological development level of Korea and the focus of the government in the healthcare sector.



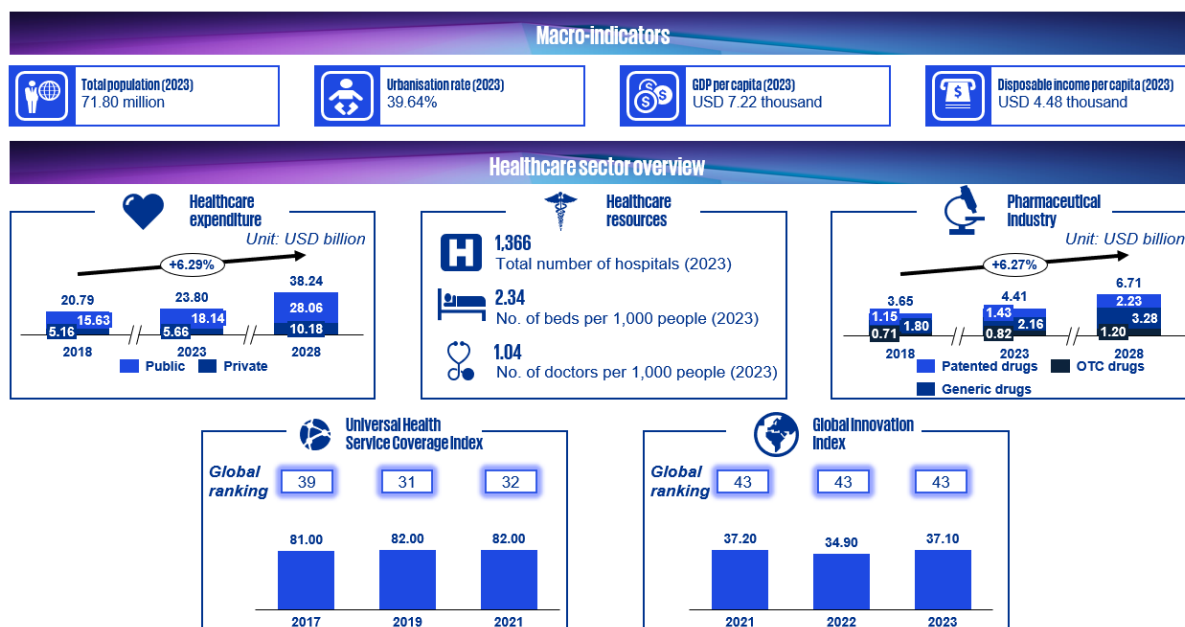
## Digital Health Innovation Hubs

The Deagu Medical Cluster, established in 2009 in Daegu, South Korea, has emerged as a dynamic hub for innovation and collaboration in healthcare. With a significant investment of USD 3.5 billion, it encompasses 72 medical facilities, 10 medical universities, and 29 pharmaceutical and digital health technology companies, fostering an environment for innovation and growth. Focused on drug and medical device development, the cluster houses cutting-edge research centres and clinical trial facilities, enabling companies to progress through all stages of product development efficiently. Key achievements include housing over 130 biomedical startups as well as fostering collaboration between universities and startups, and driving economic growth and technological advancement in the region. Moving forward, the cluster aims to nurture healthcare expertise and promote collaborative networks, further enhancing innovation and practical training for medical practitioners.

Established in 2017, Seoul Biohub has stood out as the primary frontier of digital health and health innovation in Korea. In essence, Seoul Biohub is an industry cluster supported by the government that offers office spaces in metropolitan Seoul at below-market prices, looking to leverage the benefits of agglomeration economics. Currently, the area encompasses 2 medical facilities, 8 universities, 33 pharmaceutical companies, and 29 digital health and technology companies, all of whom can take advantage of state-of-the-art lab equipment, services, and expert networks to accelerate innovation. In total, the building of such facilities and the acquisition of land have amounted to over USD 160 million in funding by the Seoul Metropolitan Government, demonstrating a significant commitment to the sectoral growth of digital health. In addition to being start-up-centric, the government also offers residency for financial and legal service companies, which will provide systematic and healthcare-curated support for health firms across business cycles in their growth and market entry strategies. This enables firms to specialise in areas of comparative advantage, maximising innovative output. Furthermore, the hub also serves to drive competition in the digital healthcare sector through international collaboration with firms such as Johnson & Johnson (J&J), Roche Diagnostics, Novartis and Bristol-Myers Squibb, who hold startup competitions and events as a way to share expert insights whilst attracting attention able to be used to mobilise private investment. Overall, these initiatives have largely been effective, as evidenced by their ability to support the rise of over 130 successful biomed startups in areas of drug development, digital healthcare, and medical devices in 2023.

In addition, in 2019, the Gangwon Special Self-Governing Province, centred on Chuncheon and Wonju, was selected as Korea's first "Global Innovation Special Zone." The area aims to develop the digital health industry by enabling the development and testing of digital health initiatives such as telehealth. Since its establishment, 32 businesses, agencies, and hospitals have been established, and they have been successfully implementing projects in the area. This trend is expected to continue, with the government pledging over 86 billion won over the next 6 years to support research, development, and overseas expansion pertaining to matters of digital health and AI. Mirroring the Seoul Biohub, the Gangwon Special Self-Governing Province aspires to establish itself as the next industry cluster tailored explicitly to digital health, incentivizing and encouraging innovation in the field. Noteworthy initiatives, such as Neo-Able, a developer of IoMT (Internet of Medical Things) capable of measuring physical health conditions, exemplify the region's commitment to pioneering technologies essential for telehealth applications. Overall, the Korean government's establishment of a special regulatory zone is expected to be a driving force behind ongoing innovation in the digital health sector.

### 2.4.4. Thailand



Source: Fitch Solutions, EIU (number of doctors)

Thailand, despite its modest geographical size, boasts a substantial population of 71.80 million, primarily residing in rural areas, with an urbanisation rate of 39.64% (2023). Thailand's low urbanisation rate shows a glaring need for digital health solutions that can alleviate the logistical challenges of digital healthcare delivery. Thailand is an upper-middle-class country with a GDP per capita of USD 7.22 thousand and a disposable income per capita of USD 4.48 thousand.

As of 2023, Thailand's total health expenditure stands at USD 23.80 billion, with a substantial 75% attributed to public health expenditure, reaching USD 18.14 billion. The total health expenditure figure is anticipated to grow with a forecasted CAGR of 6.29% from 2018 to 2028, highlighting the influx of both public and private investments. This financial momentum has resulted in tangible outcomes, including a rise in the number of hospitals to 1,366 in 2023, alongside significant increases in the number of doctors and beds per 1000, standing at 1.04 and 2.34, respectively. However, when compared to advanced healthcare centres, these figures reveal inadequate health infrastructure, creating a promising market for digital health solutions that are able to alleviate existing burdens on healthcare. Moreover, Thailand's pharmaceutical industry is poised for growth and is projected to have a CAGR of 6.27%. This increased revenue can be strategically leveraged to integrate pharmaceuticals into digital health solutions.

These advancements can be reflected in the Universal Coverage Index, as Thailand moved up seven places from 2017 to 2021. However, challenges persist, as indicated by the Global Innovation Index, which ranked Thailand 43rd for 3 straight years. This suggests insufficient spending on R&D, potentially hindering the seamless development of a digital health hub.

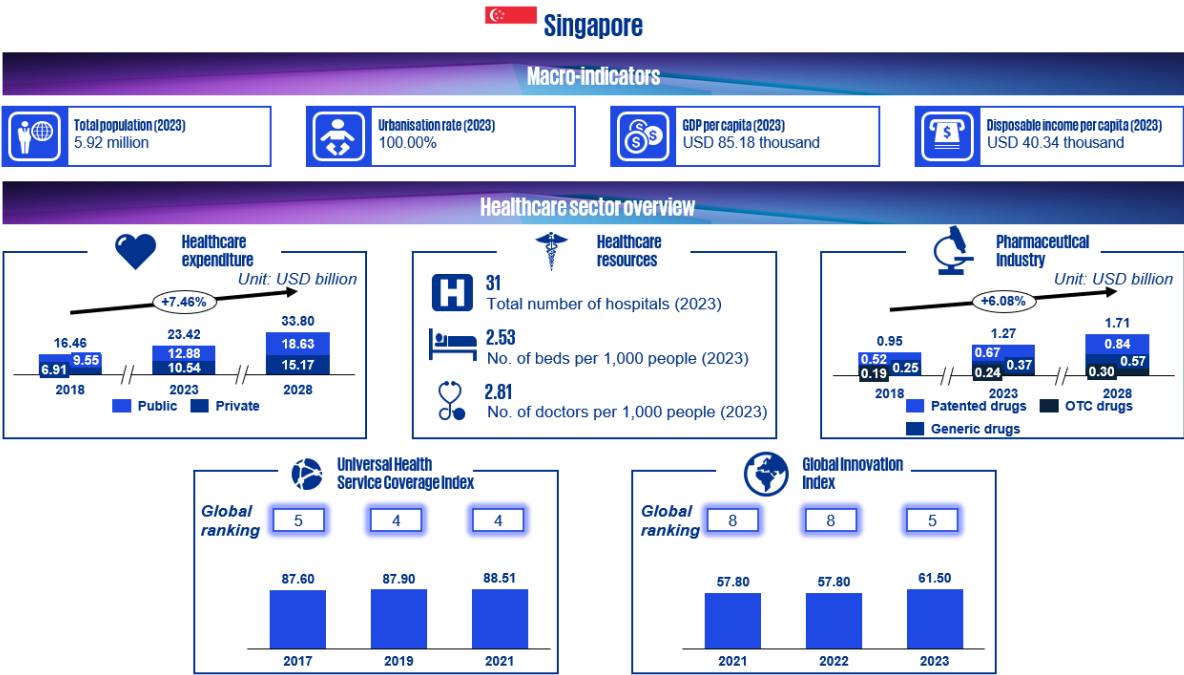
## Digital Health Innovation Hubs

The Yothi Medical Innovation District (YMID) is the first and only digital health innovation hub in Thailand. Since its inception in 2018, YMID has evolved into a collaborative nexus, strategically bringing together health institutions, universities, and start-ups to foster a Thai medical brand. Comprising 12 cutting-edge medical facilities and organisations, 2 universities, 3 co-working spaces, 36 laboratories, 27 research and technology centres, and 2 start-up incubators, YMID has become a focal point for ground-breaking advancements in healthcare. This is exemplified by the implementation of a ground-breaking data and bed-sharing system, optimising healthcare delivery to align with individual patient conditions. Presently, the district boasts an impressive portfolio of 163 supported projects, ignited by a substantial influx of government investments and private funding totalling over USD 300 million. This influx of private capital

has been catalysed, in part, by a strategic 50% reduction in corporate income tax for innovative health start-ups in the zone lasting 5-8 years sanctioned by the Board of Investment.

Further, in line with the cluster's objectives of collaboration, the NIA has outlined the introduction of mentoring programmes between hospitals, universities, and companies aimed at making clinical research and testing more comprehensive and efficient. Moreover, active efforts to collaborate with international firms, such as Advanced Info Services, Mellow Innovation, and JLK Inspection Korea, bring invaluable experience and expertise in the application of AI and robotics in the medical field. These initiatives also double as a programme to enhance the quality and digital literacy of its healthcare personnel, better equipping Thailand with the capacity to embrace the integration of digital health into its healthcare system. Over its lifespan, these YMID's initiatives have resulted in the creation of over 150 innovations, 20 new projects, and seven extension projects within the area. Ultimately, the burgeoning success of YMID positions Thailand as a frontier of digital health in the SEA, poised to lead breakthroughs in medical activities and reduce reliance on imports of such goods. From this, we can infer that the key factors for the success of a digital health cluster in Thailand lie in the NIA's ability to foster a robust network of collaboration, entrepreneurship, and investment facilitated by the easing of regulations and curated government incentives.

### 2.4.5. Singapore



Source: Fitch Solutions, EIU (number of doctors)

Singapore has a comparatively small population of 5.92 million people with a 100% urbanisation rate. Singapore has a notable high GDP per capita of USD 85.18 thousand and a high disposable income of USD 40.34 thousand, which is attributed to its high investment in capital growth.

The country has a relatively high healthcare expenditure of USD 23.42 billion in 2023 and a forecasted high healthcare expenditure growth rate of 7.46% in the period of 2018 to 2028 due to the rapid growth in its ageing population that results in an increase in demand for healthcare services. Currently, Singapore possesses 31 hospitals nationally, with a bed rate of 2.53 per 1,000 people in 2023. Singapore faces a shortage of doctors, with only 2.81 doctors per 1,000 people in 2023, due to the lack of medical universities and the strict regulation on medical accreditations. The pharmaceutical industry in Singapore is primarily constituted by patented drugs and generic drugs, representing 81.5% on average between 2018 and 2028. Additionally, Singapore's pharmaceutical industry experienced a rapid growth rate of

6.08% between 2018 and 2028, with the majority of the growth coming from patented drugs and generic drugs. The strong growth in patented drugs strongly implies vigorous R&D activities that are protected and supported by proper regulations and patents in Singapore, with generic drugs following the exclusivity expirations.

Singapore has been consistently ranked 4th and 5th in the Universal Health Service Coverage Index between 2017 and 2021. This is achieved thanks to the country's strong interconnected network of healthcare systems. On the other hand, Singapore performed worse in the Global Innovation Index between 2021 and 2022, which could be due to the strong impact of COVID-19. However, Singapore then rebounded back to 4th in 2023, which indicates it is a leading innovation country with a strong promotion of innovation, supported by its advanced infrastructure for innovation.

## Digital Health Innovation Hubs

Singapore currently possesses three digital health innovation hubs, including Health City Novena, the Centre of Health Innovation (CHI), and the Alice Lee Innovation Centre of Excellence.

Health City Novena was established in 2013 as part of the collaboration between the Ministry of Health (MOH), the National Healthcare Group (NHG), and Tan Tock Seng Hospital (TTSH) to build a regional health system in the central region of Singapore, which aimed to allow Singapore to develop its medical excellence through R&D and provide more accessible and higher quality care to Singaporeans. As of 2023, HealthCity Novena is home to 10 medical facilities, with three interconnected national facilities equipped with cutting-edge technology, including the National Skin Centre, the National Centre for Infectious Diseases, and the Integrated Care Hub, which plays a pivotal role in Singapore's healthcare system. These three facilities fulfil two of the four key activities of HealthCity Novena, which optimises the transfer of patients and information and allows for immediate and convenient access to a diverse range of healthcare services such as isolation, rehabilitative, subacute, and palliative care by assimilating the three facilities with the hospitals and facilities within the hub. The third key activity is continuous learning and innovation, which integrates university courses with professional medical training through the collaboration of the two universities and two hospitals located in the hub. The last key activity is the development of communities, which aims to build an environment that fosters relationships and balances functional development, resulting in the development of the TTSH Museum and Central Park. These four key activities establish the foundation of the hub and provide a guideline for future developments.

Established in 2015 in Singapore, the Centre for Health Innovation (CHI) has received significant investments totalling over USD100,000. Supported by the government, particularly the Ministry of Health, CHI spearheads numerous projects aimed at revolutionising healthcare. Initiatives such as Healthcare InnoMatch 2023 and the Ng Teng Fong Healthcare Innovation Programme are a testament to the government's commitment to fostering innovation in healthcare. CHI's focus spans improving healthcare through knowledge sharing, promoting a culture of innovation, and providing funding and rewards for start-ups with innovative health solutions. Hence, CHI has also collaborated with well-known universities such as the National University of Singapore (NUS) and Nanyang Business School, as well as various medical and health-tech facilities and commercial partners. With a technology portfolio encompassing artificial intelligence, telehealth, robotics, and digital services, CHI is at the forefront of digital transformation in healthcare. The establishment of the Digital and Smart Health Office further underscores CHI's dedication to driving innovation through funding, design consultancy, and robotic process automation. As Singapore grapples with an ageing population and workforce challenges, CHI's mission to co-learn and co-create new healthcare innovations is crucial to ensuring high-quality, cost-effective care for patients in the future.

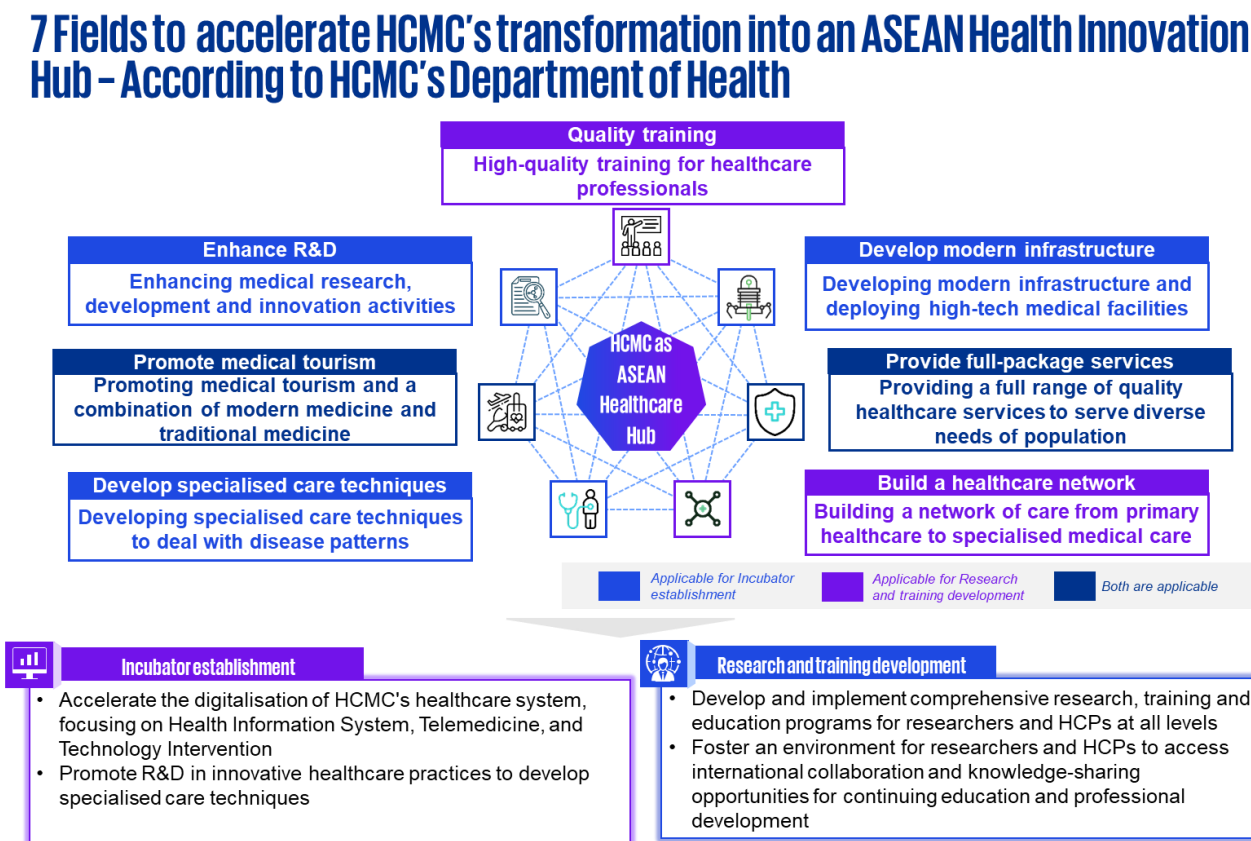
The latest innovation hub in Singapore, Alice Lee Innovation Centre of Excellence (A.L.I.C.E.), launched in 2023 with the vision of becoming the leading translation platform for transforming healthcare delivery through impactful innovations. Collaborating partners of A.L.I.C.E. range from medical institutes, medical universities, and affiliates across healthcare sectors. A.L.I.C.E. is a pioneering initiative focusing on bringing health institutions together to share knowledge and devise innovative solutions. With a technological emphasis on utilising VR tools to detect mild cognitive impairment in seniors, A.L.I.C.E.

aims to address critical healthcare challenges. Its key activities include serving as a physical platform for co-developing innovative ideas, fostering partnerships and collaboration opportunities, and providing support for matching domain-specific technologies. Additionally, A.L.I.C.E. offers prototyping support to advance early-phase projects, facilitating the translation of concepts into tangible solutions. Through its comprehensive approach, A.L.I.C.E. endeavours to drive innovation in healthcare, ultimately enhancing patient care and outcomes.

### 3. Strategy Roadmap for HCMC to develop its digital innovation centre

Vietnam's GDP has been steadily increasing, but the rate of healthcare expenditure is expected to surpass this growth, posing a significant financial challenge. Despite government efforts to improve healthcare governance and expand private facilities, overcrowding in urban public hospitals persists, leading many citizens to seek medical treatment abroad. Ho Chi Minh City (HCMC), as Vietnam's economic centre, is crucial in addressing these issues. With substantial government support, HCMC aims to become a regional healthcare innovation hub by 2045, serving its population and neighbouring countries. Leveraging digital health technologies, HCMC has the potential to address healthcare disparities and drive sustainable growth in Vietnam. Embracing digital health solutions will allow Vietnam to improve operational efficiency and health outcomes while lowering the individual cost of care per patient and allowing more patients to be treated with the same budget allocation. The Department of Health in HCMC has targeted the transformation of the city into a regional health innovation hub, for which it has identified seven critical aspects that require attention in the long term. Two primary areas have been outlined in HCMC's strategic roadmap for accomplishing the seven solutions. These areas include:

- Incubator establishment
- Research and training development

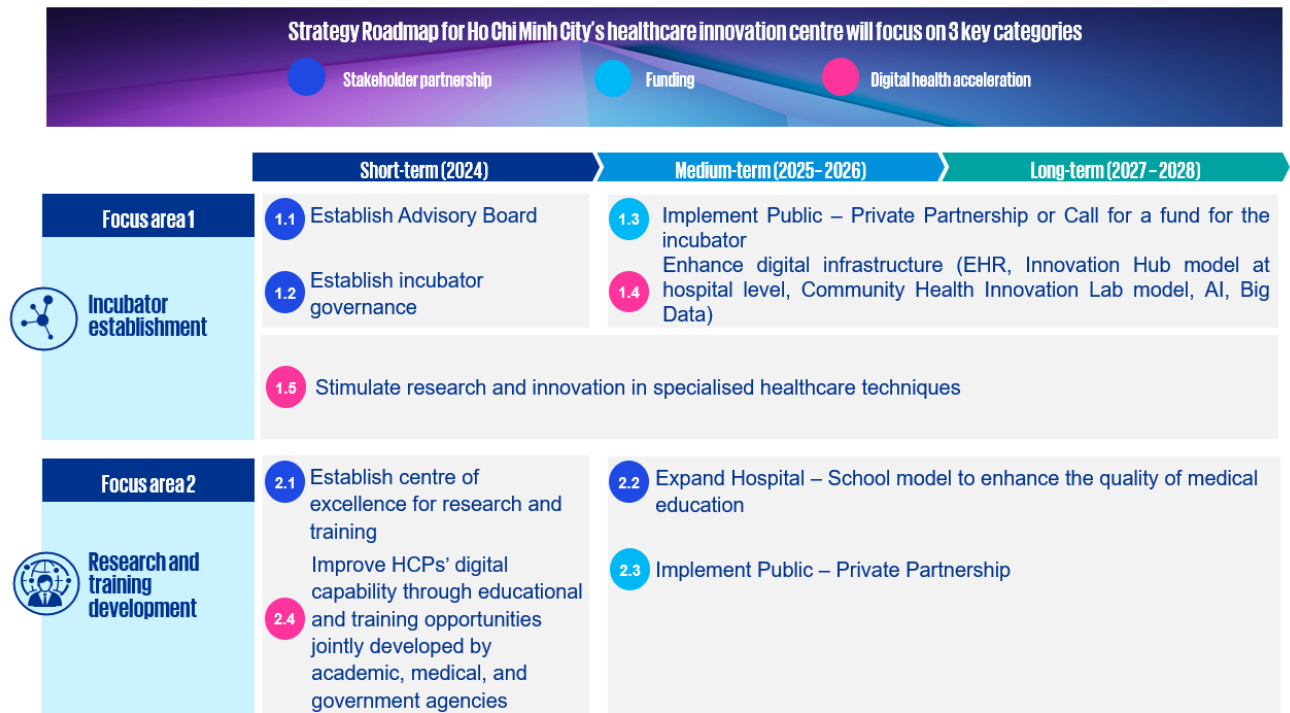




Firstly, the goal is to establish an incubator for digital health to foster digitalization efforts that facilitate the development of specialised care techniques, leverage technology to enhance patient outcomes and advance medical practices in specialised fields. Secondly, there should be a commitment to improve research and healthcare education efforts by implementing top-tier training programmes tailored for general practitioners and specialised doctors, emphasising advanced research skills and knowledge essential for modern healthcare.

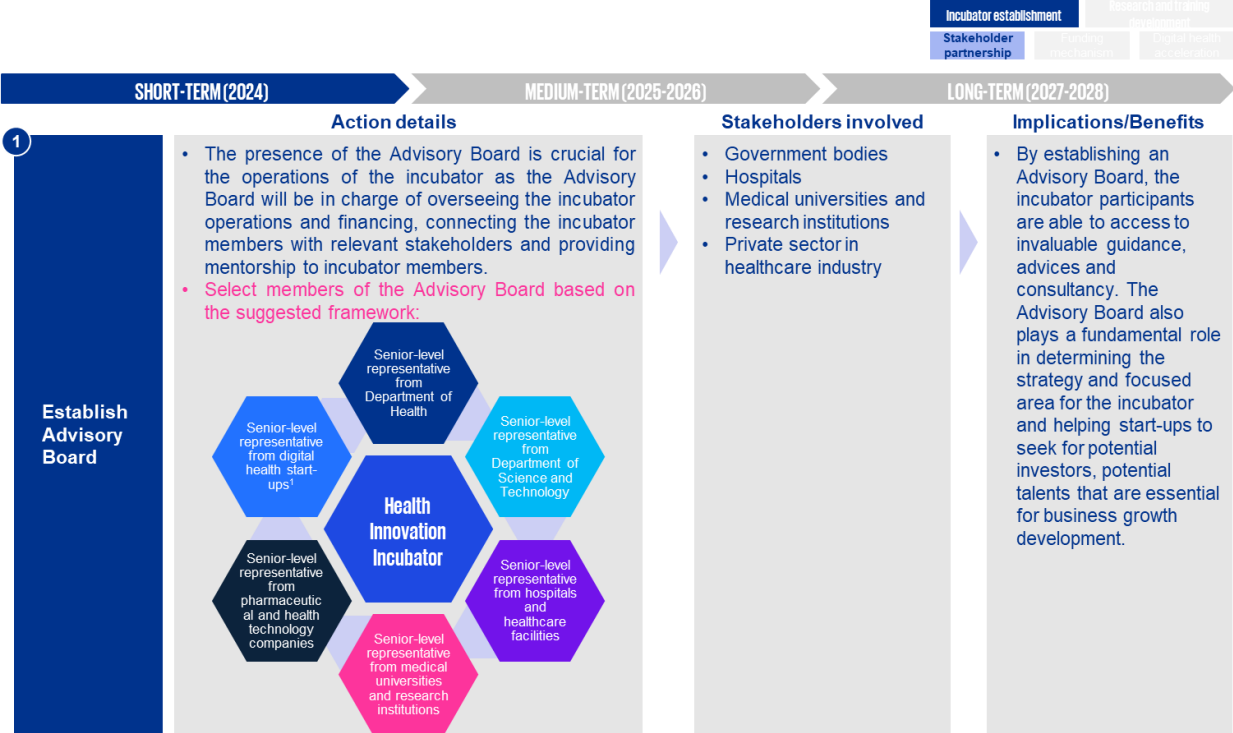
In order to become a future healthcare innovation hub in the Southeast Asia region, the strategy roadmap will play a critical role in determining Ho Chi Minh City’s healthcare system trajectory and determining activities to contemplate two key objectives, with a set of nine action items divided into short-term, medium-term, and long-term that aim to achieve the two outlined objectives.

## Strategy Roadmap for Ho Chi Minh City’s healthcare innovation centre



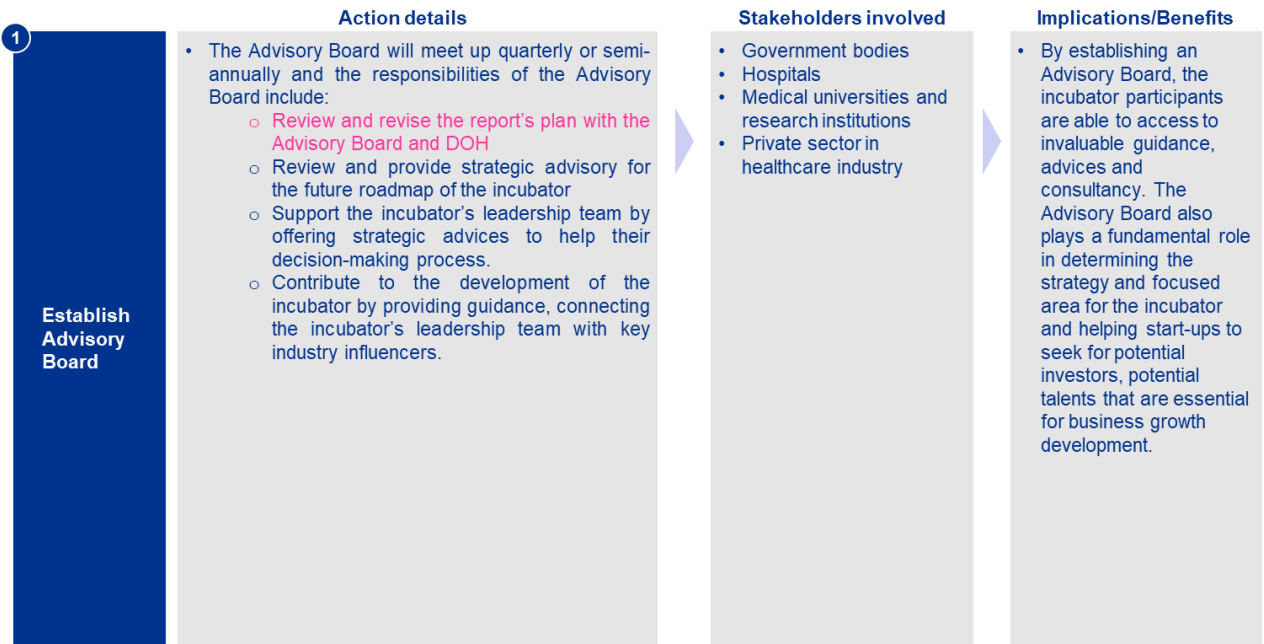
The detailed action in the roadmap will determine which stakeholders will be involved and their respective activities to achieve the ultimate goal of becoming a digital health innovation hub in terms of establishing an incubator and developing research and training in medical field, and lastly showcasing the potential benefits for implementing these activities.

# Establish Advisory Board



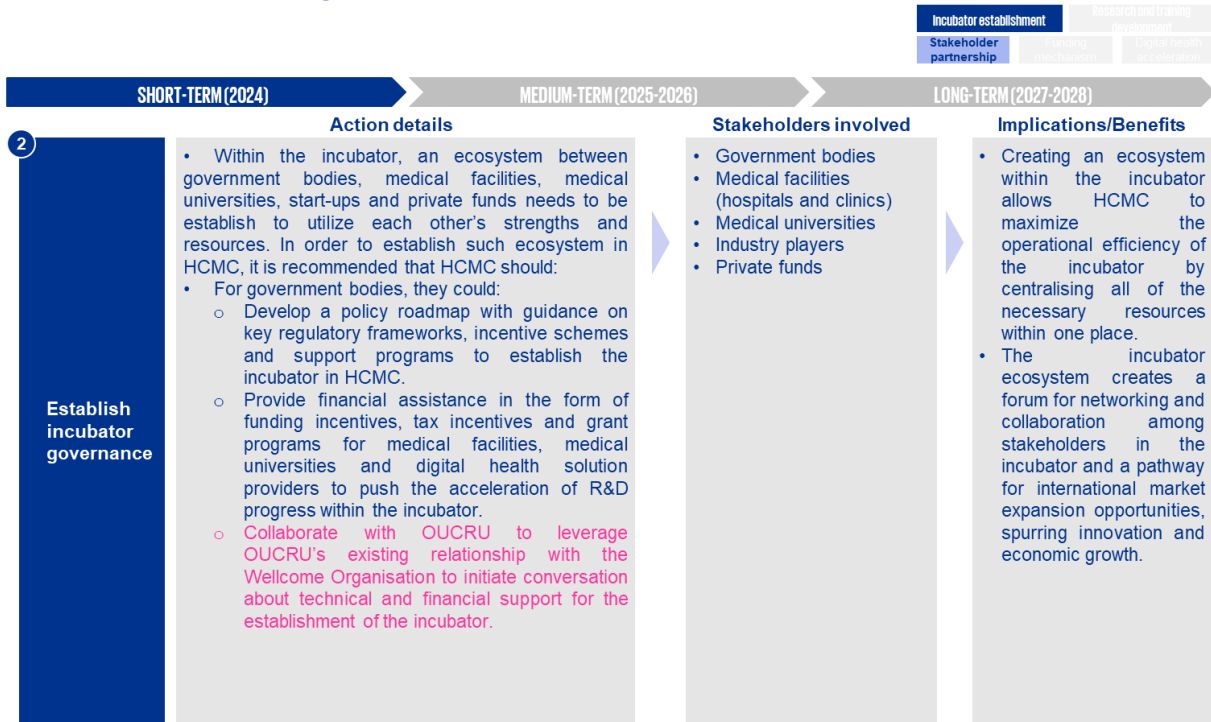
Note: (1) Preferably one with extensive experience in medical marketing and in attracting investors

In pink: Collaborate with UK stakeholders



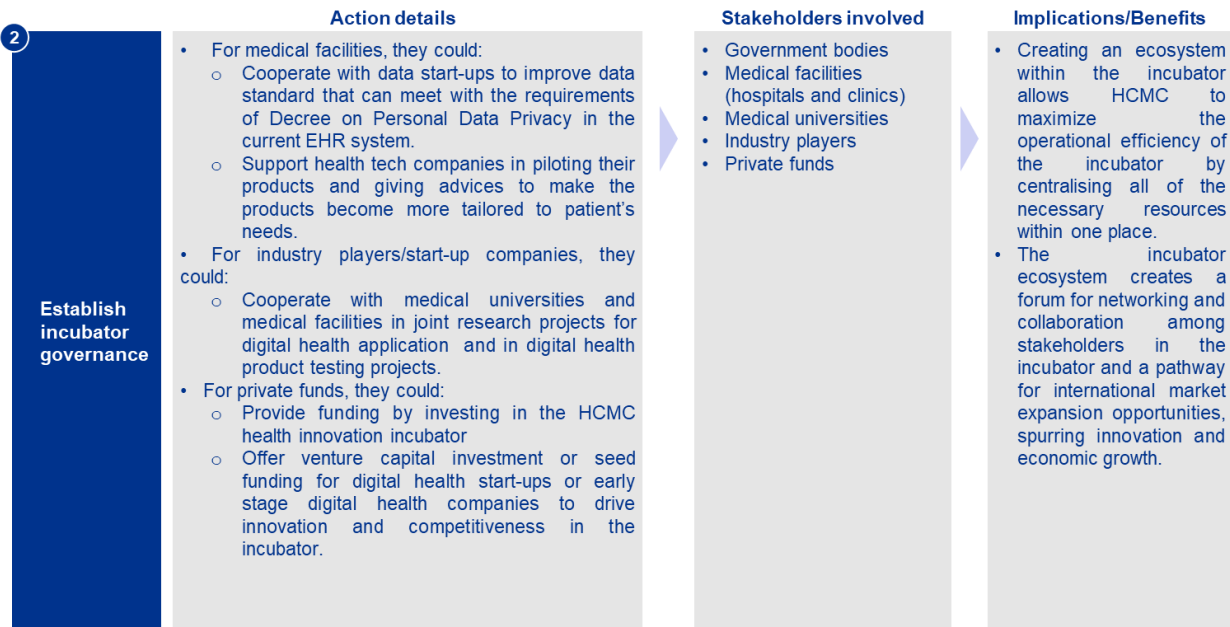
In pink: Collaborate with UK stakeholders

# Establish incubator governance

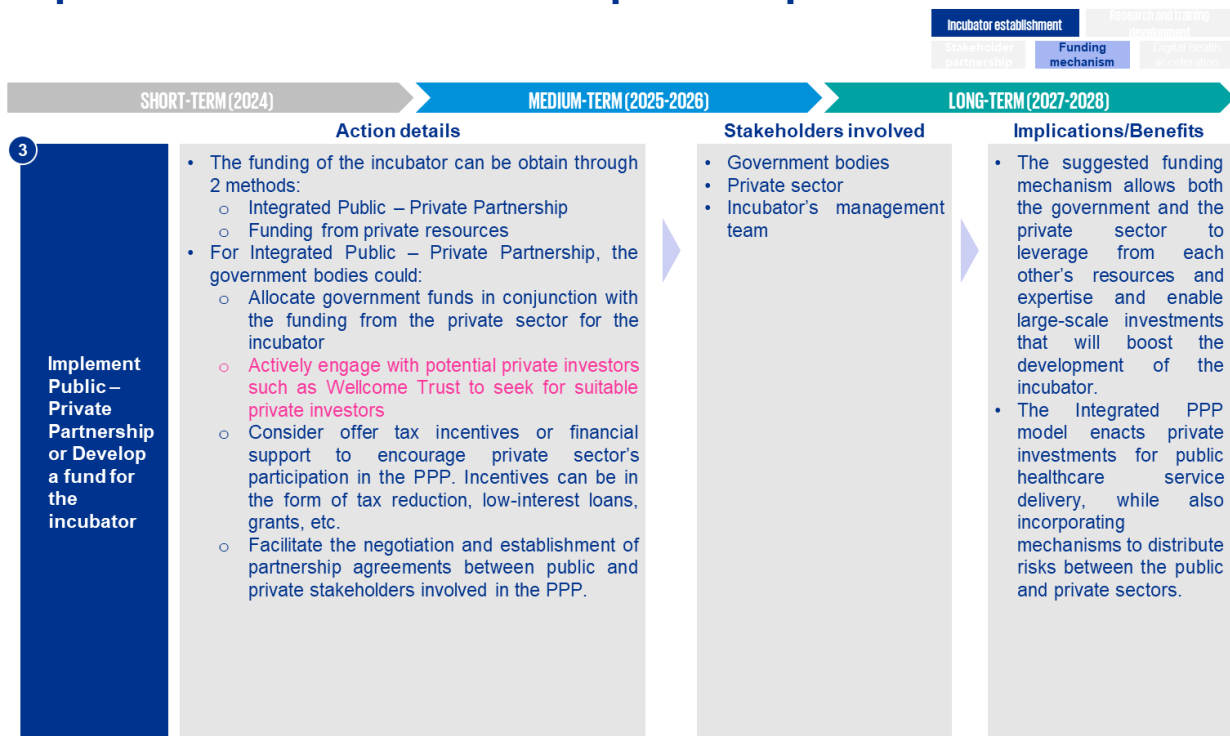


In pink: Collaborate with UK stakeholders





## Implement Public – Private Partnership or Develop a fund for the incubator



In pink: Collaborate with UK stakeholders

| 3<br>Implement Public – Private Partnership or Develop a fund for the incubator | Action details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Stakeholders involved                                                                                                            | Implications/Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|                                                                                 | <ul style="list-style-type: none"> <li>Under the Integrated Public – Private Partnership, the private sector could:               <ul style="list-style-type: none"> <li>Provide financial investment to support the establishment and operations of the incubator. This can be done in the form of co-investment with the government, equity investments, direct funding or in-kind contributions such as infrastructure, equipment or services.</li> <li>Provide assistance for the incubator in areas including business development, marketing and IP protection.</li> <li>Establish strategic partnerships or collaborations with start-ups within the incubator to co-create products, or leverage their combined resources to explore new digital health opportunities.</li> <li>Connect start-ups with potential customers, partners, investors and suppliers</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Government bodies</li> <li>Private sector</li> <li>Incubator's management team</li> </ul> | <ul style="list-style-type: none"> <li>The suggested funding mechanism allows both the government and the private sector to leverage from each other's resources and expertise and enable large-scale investments that will boost the development of the incubator.</li> <li>The Integrated PPP model enacts private investments for public healthcare service delivery, while also incorporating mechanisms to distribute risks between the public and private sectors.</li> </ul> |

| 3<br>Implement Public – Private Partnership or Develop a fund for the incubator | Action details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Stakeholders involved                                                                                                            | Implications/Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|                                                                                 | <ul style="list-style-type: none"> <li>For funding from private resources, the incubator's management team could:               <ul style="list-style-type: none"> <li>Call for funding from venture capitalists or angel investors or private funds.</li> <li>Engage with relevant professional associations that connect entrepreneurs with investors to attract potential venture capitalists and angel investors.</li> <li>Develop suitable marketing strategies by preparing pitch decks that highlight detailed business plan, ROI potential to attract potential investors.</li> <li>Consider providing attractive investor incentives, such as preferential access to deal flow, opportunities to participate in follow-on funding rounds and exclusive access to innovation within the incubator's ecosystem.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Government bodies</li> <li>Private sector</li> <li>Incubator's management team</li> </ul> | <ul style="list-style-type: none"> <li>The suggested funding mechanism allows both the government and the private sector to leverage from each other's resources and expertise and enable large-scale investments that will boost the development of the incubator.</li> <li>The Integrated PPP model enacts private investments for public healthcare service delivery, while also incorporating mechanisms to distribute risks between the public and private sectors.</li> </ul> |



# Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)

|                         |                         |                         |
|-------------------------|-------------------------|-------------------------|
| Incubator establishment | Incubator establishment | Incubator establishment |
| Incubator establishment | Incubator establishment | Incubator establishment |
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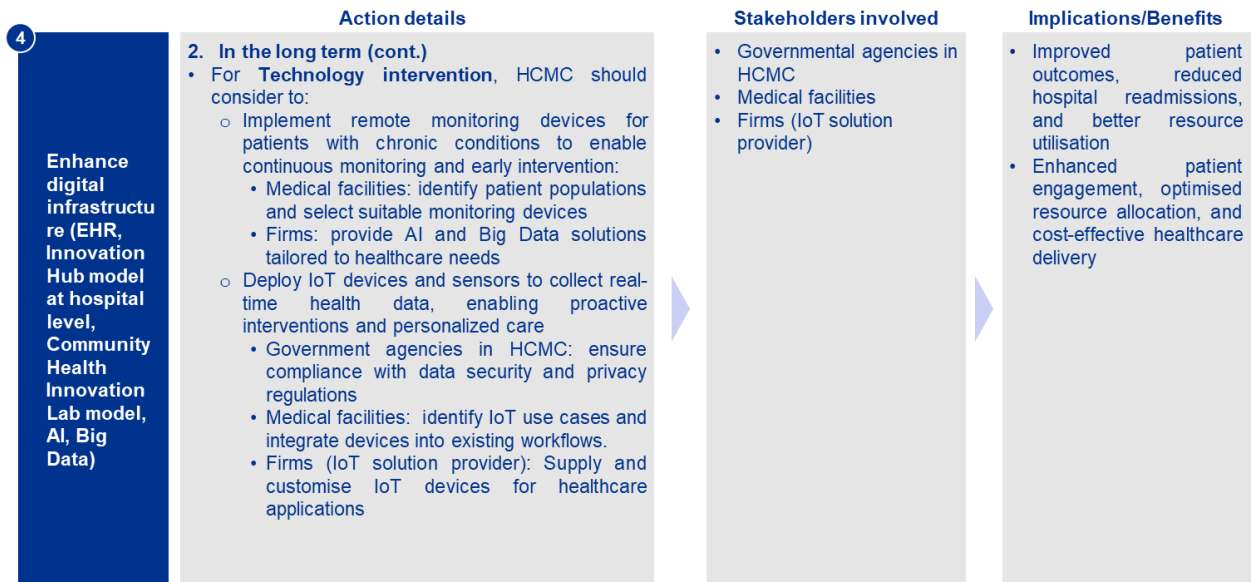
| SHORT-TERM (2024)                                                                                                                                        | MEDIUM-TERM (2025-2026)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | LONG-TERM (2027-2028)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p><b>4</b></p> <p>Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)</p> | <p><b>Action details</b></p> <ul style="list-style-type: none"> <li>The enhancement of digital infrastructure should focus on the following digital health facets           <ol style="list-style-type: none"> <li><b>In the medium term:</b> <ol style="list-style-type: none"> <li>Health information technology – EHRs               <ul style="list-style-type: none"> <li>Establish a platform for seamless exchange of patient information</li> </ul> </li> <li>Telemedicine               <ul style="list-style-type: none"> <li>Integrate EHRs with telemedicine</li> </ul> </li> </ol> </li> <li><b>In the long term:</b> <ol style="list-style-type: none"> <li>Piloting “Innovation Hub” model and “Community Health Innovation Lab” model</li> <li>AI &amp; Big Data applications               <ul style="list-style-type: none"> <li>Invest in AI &amp; Big data infrastructure</li> <li>Promote data sharing and cooperation</li> </ul> </li> <li>Technology interventions               <ul style="list-style-type: none"> <li>Deployment of remote monitoring devices</li> <li>Implement IoT-enabled healthcare solutions</li> </ul> </li> </ol> </li> </ol> </li> <li><b>In the medium term</b> <ul style="list-style-type: none"> <li>For <b>health information technology (EHRs)</b>, HCMC should consider to establish a platform for seamless exchange of patient information:               <ul style="list-style-type: none"> <li>Government agencies in HCMC: Collaborate with the Ministry of Information and Communication to provide regulatory guidance and support</li> </ul> </li> </ul> </li> </ul> | <p><b>Stakeholders involved</b></p> <ul style="list-style-type: none"> <li>Medical facilities</li> <li>Technology firms</li> <li>Ministry of Information and Communication</li> <li>Patients</li> </ul> <p><b>Implications/Benefits</b></p> <ul style="list-style-type: none"> <li>Enhance care coordination</li> <li>Reduce medical errors</li> <li>Improve patient outcomes</li> <li>Increase access to healthcare services</li> <li>Reduce healthcare cost</li> <li>Improve patient satisfaction</li> </ul> |

|                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <p><b>4</b></p> <p>Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)</p> | <p><b>Action details</b></p> <ol style="list-style-type: none"> <li><b>In the medium term (cont.)</b> <ul style="list-style-type: none"> <li>Medical facilities: Establish a platform to gather patients information collected at hospitals to ensure seamless exchange of data across different facilities. The data interoperability of the platform can be improved by implementing the HL7 FHIR standard to allow effective data transmission between stakeholders</li> <li>Technology firms: design and develop the platform according to industry standards</li> <li>At the same time, organize awareness programs to promote the usage of EHR in local public.</li> </ul> </li> <li>For <b>telemedicine</b>: consider integrating EHRs with telemedicine once the EHR system is completed to allow efficient data transmission           <ul style="list-style-type: none"> <li>Medical facilities: Implement integration protocols and provide training to staff</li> <li>Technology companies: Develop interfaces for seamless data exchange and ensure interoperability between EHR and telemedicine systems</li> </ul> </li> </ol> | <p><b>Stakeholders involved</b></p> <ul style="list-style-type: none"> <li>Medical facilities</li> <li>Technology firms</li> <li>Ministry of Information and Communication</li> <li>Patients</li> <li>Medical facilities</li> <li>Technology firms</li> </ul> <p><b>Implications/Benefits</b></p> <ul style="list-style-type: none"> <li>Enhance care coordination</li> <li>Reduce medical errors</li> <li>Improve patient outcomes</li> <li>Increase access to healthcare services</li> <li>Reduce healthcare cost</li> <li>Improve patient satisfaction</li> </ul> |
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|   | Action details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Stakeholders involved                                                                                                                      | Implications/Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 4 | <p><b>Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)</b></p> <p><b>2. In the long term</b></p> <ul style="list-style-type: none"> <li>For piloting "Innovation Hub" model and "Community Health Innovation Lab" model, DoH plays a central role: <ul style="list-style-type: none"> <li>DoH consider to encourage affiliated hospitals to research and pilot the "Innovation hub" model of Alder Hey Children's Hospital, Liverpool. In the future, the DoH should encourage Children's Hospital 1 to proactively connect online with Alder Hey Hospital to study and learn more about the innovation unit model within the hospital for pilot implementation</li> <li>Through the UK Consulate General in Ho Chi Minh City, the DoH continues to connect, research and learn the model of "Community Health Innovation Lab" (Civic Health Innovation Lab-CHIL), in parallel with implementing the roadmap for building Big Data of the City's healthcare sector</li> <li>Follow-up discussions with ASEAN Business Council to explore how they can support DOH (in Q3 – Q4 2024)</li> <li>Discuss with Astra Zeneca about the innovation centre (in Q4 2024)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Governmental agencies in HCMC</li> <li>Medical facilities</li> <li>Research institutions</li> </ul> | <ul style="list-style-type: none"> <li>This initiative enables affiliated hospitals to adopt cutting-edge practices and technologies, enhancing the quality of healthcare services available to residents. Additionally, connecting with international partners like Alder Hey Hospital and the UK Consulate General provides access to global best practices and expertise, facilitating the development of innovative solutions tailored to Ho Chi Minh City's specific healthcare needs.</li> </ul> |

*In pink: Collaborate with UK stakeholders*

|   | Action details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Stakeholders involved                                                                                                                      | Implications/Benefits                                                                                                                                                                                                                                                    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | <p><b>Enhance digital infrastructure (EHR, Innovation Hub model at hospital level, Community Health Innovation Lab model, AI, Big Data)</b></p> <p><b>2. In the long term (cont.)</b></p> <ul style="list-style-type: none"> <li>For <b>AI &amp; Big data implication</b>, HCMC should consider to: <ul style="list-style-type: none"> <li>Invest in infrastructure, specifically allocating resources to procure and implement hardware and software for data storage, processing, and analysis: <ul style="list-style-type: none"> <li>Government agencies in HCMC: should offer funding and regulatory support for infrastructure development</li> <li>Medical facilities: identify data analytics requirements and potential use cases</li> <li>Technology firms: provide AI and Big Data solutions tailored to healthcare needs</li> </ul> </li> <li>Promote data sharing and cooperation by establishing frameworks for data sharing and collaboration among healthcare providers to leverage collective insights for research and innovation <ul style="list-style-type: none"> <li>Government agencies in HCMC: should facilitate policy development and funding for collaborative initiatives</li> <li>Medical facilities: contribute anonymized data and expertise for collaborative projects.</li> <li>Research institutions: Conduct joint studies and analyses to extract actionable insights</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Governmental agencies in HCMC</li> <li>Medical facilities</li> <li>Research institutions</li> </ul> | <ul style="list-style-type: none"> <li>Enables data-driven decision-making, personalized medicine, and predictive analytics for better patient care</li> <li>Accelerated medical research, enhanced disease surveillance, and improved public health outcomes</li> </ul> |



## Stimulate research and innovation in specialised healthcare techniques



|   | Action details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Stakeholders involved                                                                                                                                                                                                     | Implications/Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <p><b>Stimulate research and innovation in specialised healthcare techniques</b></p> <ul style="list-style-type: none"> <li>In the medium-term and long-term: Create platforms and networks for knowledge exchange and collaboration in specialised healthcare techniques. Develop online portals, forums, and conferences to facilitate information sharing, networking, and collaboration among stakeholders. Encourage participation from local and international experts:               <ul style="list-style-type: none"> <li>Government Health Agencies including Department of Health and Department of Education are recommended to support and facilitate knowledge exchange initiatives, promote collaboration, and address regulatory considerations</li> <li>Academic institutions are recommended to contribute research expertise, educational resources, and collaborative opportunities for knowledge exchange</li> <li>Healthcare professionals and researchers are recommended to share insights, research findings, and best practices in specialized healthcare techniques</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Department of Health</li> <li>People's Committee of HCMC</li> <li>Medical facilities</li> <li>Academic institutions</li> <li>Industry leaders</li> <li>Industry experts</li> </ul> | <ul style="list-style-type: none"> <li>Fosters continuous learning and professional development in specialized healthcare techniques</li> <li>Facilitates the exchange of best practices, research findings, and innovative ideas</li> <li>Strengthens partnerships between academia, industry, and government, driving innovation and progress</li> <li>Enhances the reputation of Ho Chi Minh City as a global leader in specialized healthcare innovation</li> </ul> |

## Establish Centre of Excellence for research and training

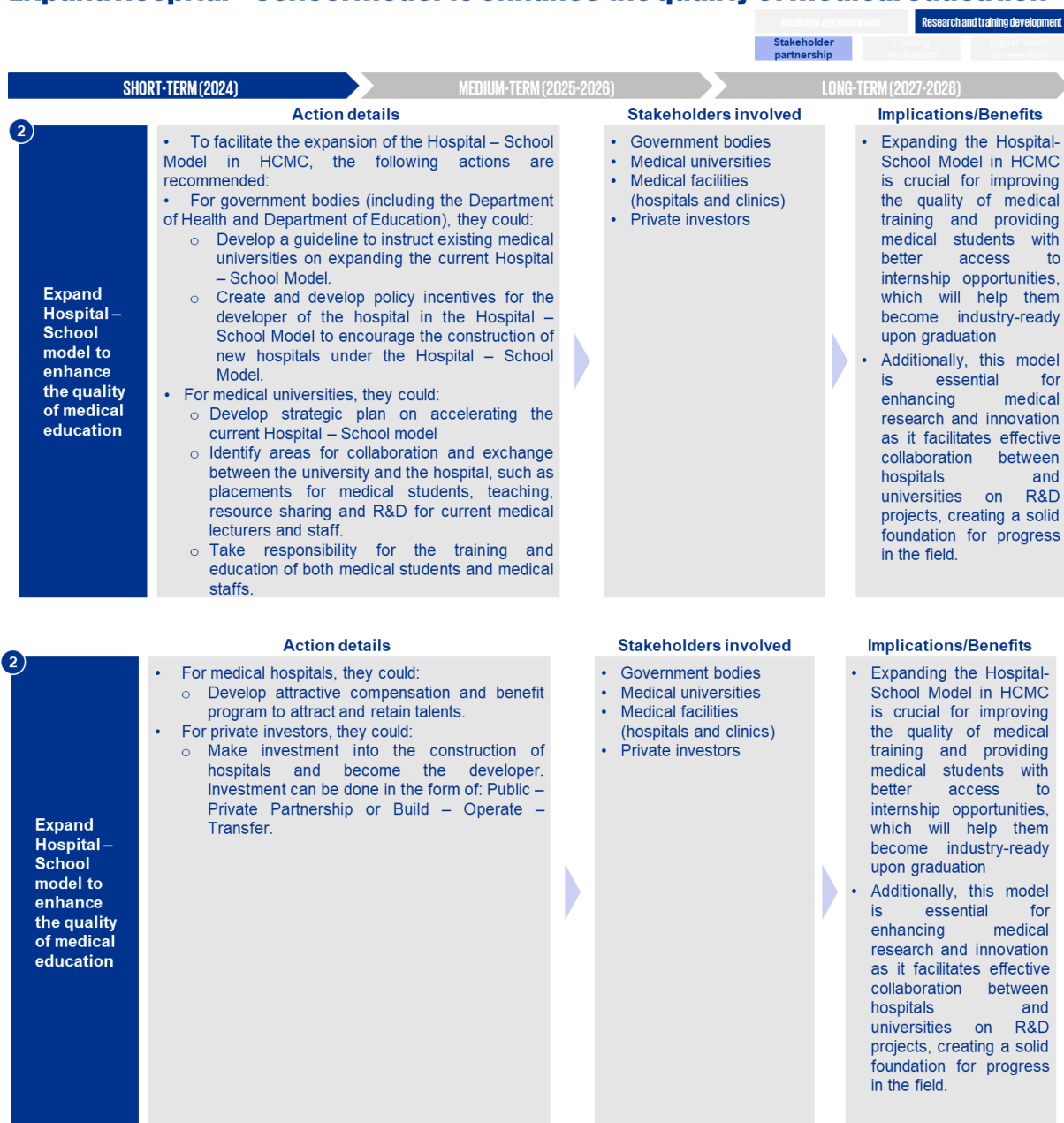
|  |  | Academy establishment   |  | Research and training development |  |
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|  |  | Stakeholder partnership |  | Funding mechanism                 |  |
|  |  |                         |  | Public health as cooperation      |  |
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In pink: Collaborate with UK stakeholders





# Expand Hospital – School model to enhance the quality of medical education



# Implement Public – Private Partnership



# Improve HCPs' digital capability through educational and training opportunities jointly developed by academic, medical, and government agencies



## 4. Priority Routes for the UK to cooperate with HCMC within the Strategy

From March 18 to March 22, 2024, the HCMC Department of Health, together with representatives from FCDO, OUCRU, and KPMG, visited the UK to discuss the application of digital health innovation in the UK's healthcare system, as well as explore new collaboration opportunities with UK stakeholders to foster digital health innovation in HCMC. A summary of key activities and key insights derived from the trip is provided in Appendix 3.

From the trip outcome, we have devised a priority route for HCMC to cooperate with UK stakeholders within the next 2 years, laying out the next-step plan for the Department of Health to engage with both local and international stakeholders to bring the HCMC digital innovation centre into reality. Details of the priority route can be found below:

### Priority Routes for HCMC to cooperate with UK stakeholders

|                      | Action items                                                    | Stakeholder involved                                                                                                                                                                                    | 2024 |    |    |    | 2025 |    |    |    |
|----------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|----|----|------|----|----|----|
|                      |                                                                 |                                                                                                                                                                                                         | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 |
| Strategic Activities | Short-run: Plan revision and stakeholder partnership initiation | Formal meeting with DOH to discuss about the report and agree a short, medium and long-term plan                                                                                                        |      |    |    |    |      |    |    |    |
|                      |                                                                 | Establish an Advisory Board for the DOH                                                                                                                                                                 |      |    |    |    |      |    |    |    |
|                      |                                                                 | Select local and international experts and stakeholders to be part of the Advisory Board                                                                                                                |      |    |    |    |      |    |    |    |
|                      |                                                                 | Review and revise the report's plan with the Advisory Board and DOH                                                                                                                                     |      |    |    |    |      |    |    |    |
|                      |                                                                 | Follow-up on specific connects made during the UK trip and define actions                                                                                                                               |      |    |    |    |      |    |    |    |
|                      |                                                                 | Encourage Oxford Nanopore to visit Vietnam and develop a plan for supporting pathogen NGS initially, with HCMC CDC as the focal point                                                                   |      |    |    |    |      |    |    |    |
|                      |                                                                 | Consider the educational opportunities offered by the BMJ, including those with offer advice on developing new technologies. Encourage a visit to Vietnam                                               |      |    |    |    |      |    |    |    |
|                      |                                                                 | Follow-up call with Wellcome to determine how support for a healthtech incubator might be obtained                                                                                                      |      |    |    |    |      |    |    |    |
|                      |                                                                 | Follow-up discussions with each of the delegates at the ASEAN Business Council discussion, exploring how they can support the DOH into the future. Convene meetings with them when they are in Vietnam. |      |    |    |    |      |    |    |    |
|                      |                                                                 |                                                                                                                                                                                                         |      |    |    |    |      |    |    |    |

|                      | Action items                                  | Stakeholder involved                                                                                                                            | 2024 |    |    |    | 2025 |    |    |    |
|----------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------|----|----|----|------|----|----|----|
|                      |                                               |                                                                                                                                                 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 |
| Strategic Activities | Long-run: Digital health initiative execution | Plan and activate the development of specific initiatives within the city that will actively promote the development of new health technologies |      |    |    |    |      |    |    |    |
|                      |                                               | Plan for the establishment of OUCRU/HTD Centre for Innovation in Critical Care (SOVICO funded), aiming to start the build in 2025               |      |    |    |    |      |    |    |    |
|                      |                                               | Discuss with Astra-Zeneca about an innovation centre                                                                                            |      |    |    |    |      |    |    |    |
|                      |                                               | Create of a DOH-supported healthtech incubator/venture builder                                                                                  |      |    |    |    |      |    |    |    |
|                      |                                               | Develop HCMC CDC as an advanced epidemiology centre for emerging infections, with assistance from ONT and OUCRU                                 |      |    |    |    |      |    |    |    |

# Appendices

## Appendix 1. Details of medical facilities collaborations in Ho Chi Minh City

### Cho Ray Hospital:

| Program                                   | Partner                                    |                                                      | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------|--------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                                   | International                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Collaborative education programmes</b> | Nguyen Tat Thanh University                |                                                      | Cho Ray Hospital signed a MOU with Nguyen Tat Thanh University in 2017 to enable additional training for healthcare professionals to ensure sufficient capabilities in providing necessary care for the public. Under the programme, Cho Ray Hospital sent experienced and high-quality professionals to participate in the management and teaching activities for both sides. Simultaneously, professors, doctors, and foreign experts at Nguyen Tat Thanh University provided maximum support in reinforcing knowledge and technical capacity for the healthcare workforce participating in the teaching activities and training skills. Two units also coordinate and organise research topics in the general healthcare field to enhance efficiency in diagnosis and treatment |
| <b>Collaborative education programmes</b> | Y Viet Trading and Service Company Limited | Drager Vietnam Company Limited                       | With the aim of updating prominent issues in mechanical ventilation in ARDS patients, chronic obstructive pulmonary disease, ECMO, and the application of new tools in optimising mechanical ventilation in ARDS patients, Y Viet Company and Draeger are collaborating with Cho Ray Hospital to organise a continuous medical education programme with the theme “Advanced Mechanical Ventilation” in May 2025.                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Educator training resources</b>        | HCMC University of Medicine and Pharmacy   | International University of Health and Welfare Japan | In 2023, together with the HCMC University of Medicine and Pharmacy and the International University of Health and Welfare, Cho Ray Hospital organised a conference on the theme of Vietnam-Japan Cooperation and Challenges in the Healthcare Sector: How Vietnam and Japan are Moving Forward to Commemorate the 50th Anniversary of the Diplomatic Relations between Vietnam and Japan. The sessions discussed topics such as the future healthcare system, the development of the medical equipment market, Japanese pharmaceuticals in Vietnam, clinical trials, establishing processes to enhance the effectiveness and safety of pharmaceuticals and medical equipment, and developing a healthcare workforce for the future.                                               |

Source: Hospital's announcement portal, KPMG research and analysis

### Thong Nhat Hospital:

| Program | Partner  |               | Details |
|---------|----------|---------------|---------|
|         | Domestic | International |         |



|                                           |  |             |                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------|--|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Collaborative education programmes</b> |  | Novartis    | In 2023, Thong Nhat Hospital, in conjunction with Novartis, organised a conference programme as a part of the TELEHEALTH remote medical examination and treatment, with the topic “Application of biological drugs in the treatment of musculoskeletal diseases.”                                     |
| <b>Collaborative education programmes</b> |  | AstraZeneca | In 2023, Thong Nhat Hospital, in conjunction with AstraZeneca, organised a conference programme as a part of the TELEHEALTH remote medical examination and treatment, with the topic “Optimising treatment strategies for cancer.”                                                                    |
| <b>Collaborative education programmes</b> |  | Sanofi      | With the assistance of Sanofi, Thong Nhat Hospital hosted a conference programme as a part of the TELEHEALTH remote medical examination and treatment initiative, with the topic “Optimising the effectiveness of preventing venous thromboembolism in surgical patients: what should we do?” in 2023 |

Source: Hospital’s announcement portal, KPMG research and analysis

### Hung Vuong Hospital:

| Program                                   | Partner                                  |                                         | Details                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                                 | International                           |                                                                                                                                                                                                                                                                                                                                                        |
| <b>Collaborative education programmes</b> | City Children’s Hospital, Tu Du Hospital |                                         | Since 2018, Hung Vuong Hospital has signed a cooperation programme with City Children’s Hospital and Tu Du Hospital to provide support in the fields of neonatal specialties related to consultation, monitoring, and treatment of special cases, emergency cases, and severe illnesses.                                                               |
| <b>Collaborative education programmes</b> |                                          | Bayer Vietnam Company Limited (Germany) | In 2023, the partnership between Bayer Vietnam and Hung Vuong Hospital revolves around two objectives: enhancing knowledge for healthcare professionals operating in the field of obstetrics and gynaecology through workshops and training on reproductive healthcare and treating obstetric and gynaecological diseases for women and the community. |

Source: Hospital’s announcement portal, KPMG research and analysis

### Children’s Hospital 1:

| Program                                   | Partner         |                                          | Details                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|-----------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic        | International                            |                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Collaborative education programmes</b> |                 | Taipei Veteran General Hospital (Taiwan) | In November 2023, Taipei Veteran General Hospital proposed to extend the MOU between Children Hospital 1 and Taipei Veteran General Hospital from 2024 to 2028, with a focus on conducting research and training on clinical skills, focusing on liver transplantation, kidney transplantation, stem cell transplantation, rare diseases, haematological disorders, and solid tumours. |
| <b>Collaborative education programmes</b> | Olympus Vietnam | Oita University (Japan)                  | In November 2023, a delegation of experts from Oita University (Japan) and Olympus Vietnam Company visited Children Hospital 1 to explore opportunities for future collaboration in endoscopy and advanced endoscopic surgery.                                                                                                                                                         |

|                                           |                                                         |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------|---------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Collaborative education programmes</b> |                                                         | Children's Heart Link (USA)     | In October 2023, two representatives from Children's Heart Link, working at the University of California, exchanged expertise on cardiology, paediatric resuscitation, and anaesthesia. During their visit, Prof. Mark Williams Cocalis and Prof. Hung Gia Nguyen, the hospital's medical team, had the opportunity to gain valuable clinical knowledge and experience in guiding resuscitation before, during, and after surgery, especially in complex cases of congenital heart defects. |
| <b>Collaborative education programmes</b> | National Institute of Haematology and Blood Transfusion | World Federation of Haemophilia | In November 2023, the delegation from the World Federation of Haemophilia and Vietnam's National Institute of Haematology and Blood Transfusion, together with the hospital's haematologist, discussed and learned about the management, diagnosis, and treatment of haemophilia.                                                                                                                                                                                                           |
| <b>Collaborative education programmes</b> |                                                         | Terumo (Singapore)              | In December 2023, Children's Hospital 1 welcomed experts from Terumo Company, Singapore, a medical device and healthcare solution firm, to participate in a professional exchange with doctors in the field of extracorporeal circulation in the heart surgery circuit.                                                                                                                                                                                                                     |

*Source: Hospital's announcement portal, KPMG research and analysis*

#### **People's Hospital 115:**

| Program                                   | Partner                                |               | Details                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------|----------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                               | International |                                                                                                                                                                                                                                                                                                                                             |
| <b>Collaborative education programmes</b> | Pham Ngoc Thach University of Medicine |               | Initiated in 2019, the successful implementation of the Hospital – University model between People's Hospital 115 and Pham Ngoc Thach University of Medicine is a highlight in training healthcare personnel. The hospital has become a practical training facility for thousands of students in the industry, both locally and nationwide. |

*Source: Hospital's announcement portal, KPMG research and analysis*

#### **Tu Du Hospital:**

| Program                                   | Partner                                            |                               | Details                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------|----------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                                           | International                 |                                                                                                                                                                                                                                                                                                                                                         |
| <b>Collaborative education programmes</b> |                                                    | Bayer Vietnam Company Limited | In October 2023, Bayer and Tu Du Hospital officially signed a strategic cooperation agreement to enhance women's healthcare and improve knowledge and clinical expertise for doctors in the fields of gynaecology and obstetrics, thereby improving the effectiveness of medical care and quality of life for Vietnamese women.                         |
| <b>Collaborative education programmes</b> | Vinmec Central Park General International Hospital |                               | To improve the calibre of obstetrics and gynaecology healthcare services, Vinmec Central Park General International Hospital and Tu Du Hospital have reached a partnership agreement. This initiated a 2018–2019 cooperation initiative between the two hospitals that will concentrate on technological improvements and specialisation. The two sides |

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|--|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | cooperated in the examination, treatment, and updating of the most advanced diagnostic methods in the field of obstetrics and gynaecology, as well as engaging in examination and treatment at Vinmec Central Park. Additionally, Tu Du Hospital will provide in-depth training in clinical techniques for Vinmec Central Park's team of doctors and nurses. At the same time, the hospital participates in professional seminars organised by Vinmec Central Park to update knowledge and experience in the field of obstetrics and gynaecology. |
|--|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Hospital's announcement portal, KPMG research and analysis

#### Gia Dinh Hospital:

| Program                            | Partner                            |                               | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------|------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | Domestic                           | International                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Collaborative education programmes |                                    | Bayer Vietnam Company Limited | In October 2023, Bayer and Gia Dinh Hospital officially signed a cooperation agreement to promote international collaboration in medicine and improve the quality of medical staff. Within the framework of the agreement, many activities are implemented to enhance the professional capacity of medical staff, increase awareness, and help the community and patients access accurate medical information and manage health conditions. The two sides will update knowledge and share clinical experience in diagnosing and treating cardiovascular diseases, cancer, infections, and women's healthcare. |
| Collaborative education programmes | Hong Bang International University |                               | Since January 2022, Hong Bang International University has signed a strategic partnership with Gia Dinh hospital, alongside leading hospitals such as Cho Ray Hospital, Thong Nhat Hospital to reinforce the fundamental knowledge and practical capabilities so the students can be ready to work in the hospitals after they graduate and further honing their skills afterwards.                                                                                                                                                                                                                           |

Source: Hospital's announcement portal, KPMG research and analysis

#### Binh Dan Hospital:

| Program                            | Partner                                    |                                    | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------|--------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | Domestic                                   | International                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Collaborative education programmes | HCMC Urology-Nephrology Association (HUNA) | European Urology Association (EAU) | In April 2023, Binh Dan Hospital, HUNA, and EAU organised a training course on urological endoscopic surgery phase 1 following the standards of the EAU for 24 urologists in Vietnam. During the 2-day training, participants were able to receive knowledge from lectures prepared by the EAU. They were given the opportunity to practice endoscopic skills on simulated urinary tract structures arranged in a surgical miniature setting at Binh Dan Hospital. |
| Collaborative education programmes | Pham Ngoc Thanh                            |                                    | Since 2017, Pham Ngoc Thach University of Medicine has signed an agreement with Binh Dan Hospital to implement the Hospital – University model jointly. The objective of this collaboration is to                                                                                                                                                                                                                                                                  |

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|  | University of Medicine |  | standardise and promote training activities and provide updates on medical advancements and applications of leading technology in training, diagnosis and treatment of the two units. Pham Ngoc Thach University of Medicine will send its staff, trainees, and students to study and directly participate in medical examination and treatment and clinical professional work. The university also supported Binh Dan Hospital in recruiting resident doctors, ensuring a high-quality workforce to serve the hospital's deep specialisation development goals. |
|--|------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Hospital's announcement portal, KPMG research and analysis

### Trung Vuong Hospital

| Program                                   | Partner                                               |               | Details                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------|-------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                                              | International |                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Collaborative education programmes</b> | School of Medicine – Vietnam National University HCMC |               | In March 2021, Trung Vuong Hospital and the School of Medicine at Vietnam National University signed a cooperation agreement to support human resource training. Both parties will jointly research, deploy the application of scientific and technological topics, transfer technology contracts, and coordinate workshops and conferences on management and expertise that both parties are interested in. |
| <b>Collaborative education programmes</b> | Hong Bang International University                    |               | In order to strengthen students' fundamental knowledge and practical skills so they can work in hospitals upon graduation and continue to hone their skills subsequently, Hong Bang International University has partnered strategically with Trung Vuong Hospital and other top medical facilities, including Cho Ray and Thong Nhat Hospital.                                                              |

Source: Hospital's announcement portal, KPMG research and analysis

### Hospital for Tropical Disease

| Program                                   | Partner                         |                                          | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------|---------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | Domestic                        | International                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Collaborative education programmes</b> | HCMC Centre for Disease Control | Oxford University Clinical Research Unit | In 2020, the Hospital for Tropical Diseases signed a MOU with the HCMC Centre for Disease Control and the Oxford University Clinical Research Unit. The strategic partnership between the institutions aims to improve the diagnosis capability for communicable diseases for medical practitioners at the HCMC Centre for Disease Control, support the HCMC Centre for Disease Control to strengthen its current infectious disease surveillance, and jointly develop new tools to identify the spread of infectious diseases in HCMC for tracking and control. |
| <b>Collaborative education programmes</b> |                                 | Oxford University Clinical Research Unit | Since 1991, the Hospital for Tropical Disease in HCMC has cooperated with the Oxford University Clinical Research Unit to conduct joint research on dangerous infectious diseases and provide technical training programmes for HCPs in the hospital and the country. Recently, both organisations have successfully implemented a project called VITAL to gather clinicians, biomedical                                                                                                                                                                         |

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|  |  |  | engineers, physiotherapists, computational scientists, and social scientists to research innovative solutions to improve critical care and ICU quality for low- to middle-income patients. |
|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Hospital's announcement portal, KPMG research and analysis

**Collaboration programmes between HCMC's hospitals and universities with strong expertise in technology/engineering to accelerate digital health**

| Program                                   | Medical facility           | Partner                                   |               | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------|----------------------------|-------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           |                            | Domestic                                  | International |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Collaborative education programmes</b> | Thong Nhat Hospital        | Ho Chi Minh City University of Technology |               | In 2020, Thong Nhat Hospital established a strategic partnership with the HCMC University of Technology with the aim of collaboratively providing high-quality digital health education and conducting joint research on innovative solutions in the field of digital health. This partnership is expected to uplift the digital implementation status at Thong Nhat Hospital, where the hospital is still struggling to implement digital tools into its daily operations. As mutually agreed, HCMC University of Technology will support Thong Nhat Hospital in implementing its EHR programme, improving its current HIS, and providing training programmes for the hospital's HCPs to enhance their digital skills. Both parties will also organise internship placements for students to help them get more familiar with IT operations in a hospital environment. |
| <b>Collaborative education programmes</b> | Nguyen Tri Phuong Hospital | Ho Chi Minh City University of Technology |               | In 2023, Nguyen Tri Phuong Hospital collaborated with HCMC University of Technology to promote a high-quality education programme, intensify scientific research in digital health, and enhance technology transfer. Specifically, HCMC University of Technology will help Nguyen Tri Phuong Hospital assess its current HIS and provide solutions to improve its interoperability and efficiency. Additionally, the university will also jointly contribute to the development of other digital systems of the hospital, including digitalisation in medical examination and treatment, a digital dashboard on hospital financial activities, a management system for pharmaceutical products, a chatbot for patient consultation, software for patient management, etc.                                                                                               |



|                                           |                                |                          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------|--------------------------------|--------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Collaborative education programmes</b> | University Medical Centre HCMC | International University |  | The University Medical Centre HCMC has established a strategic partnership with the International University by signing an MOU in 2022 with the goal of advancing research efforts on the topic of public health. Accordingly, the hospital and the university will work together to develop a more tailored curriculum for the Biomedical Engineering and Biotechnology majors, increase research projects with the university's Centre for Infectious Disease Research, and promote technology transfer. International University will also support the University Medical Centre HCMC in reaching out and connecting with technology companies to commercialise research outputs. |
| <b>Collaborative education programmes</b> | Pasteur Institute              | International University |  | Pasteur Institute signed a MOU with International University in 2022 to establish strategic cooperation between both parties and push research efforts in Microbiology, Immunology and Epidemiology. By utilising each party's core strengths, this partnership is expected to enhance medical education quality, promote joint research, create internship placement opportunities for graduates, and accelerate technology transfer.                                                                                                                                                                                                                                               |

## Appendix 2. Details of Current and Near-term Government Initiatives

### Current initiatives

|   | Legal Document                                                                                                                                             | Key focused area                                                                                                                                                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Law No.15/2023/QH15</b><br><i>Law on Medical Examination and Treatment</i><br><br><b>Circular No. 49/2017/TT-BYT</b><br><i>Circular on Telemedicine</i> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>In Law No.15/2023/QH15 and Circular No. 49/2017/TT-BYT, <b>the definition of telemedicine service and regulatory framework for governing telemedicine service was officially established.</b></li> <li>The documents <b>set a critical legal foundation to boost the implementation progress of healthcare digitalization in the field of telemedicine in Vietnam</b> by ensuring that the quality of healthcare services provided by digital health solutions adheres to the standards set by MOH and providing guidelines for all relevant stakeholders to implement telemedicine. Subsequently, the introduction of the regulatory framework for telemedicine has significantly contributed to fostering the development of a digital health hub in Vietnam in general and HCMC in specific.</li> </ul> |
| 2 | <b>Decision No. 2153/QĐ-BYT</b><br><i>Promotion of Regulations on Establishment, Use and Management of Electronic Health IDs</i>                           |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>The Decision <b>regulates the implementation of Electronic Health Records and Electronic Health IDs in Vietnam.</b></li> <li>This <b>helps the medical facilities to accelerate the completion of a unified EHR system on a city/provincial-level and on a national level</b> by setting out policies on using the Electronic Health ID that is specified on patient's Social Insurance Card as the identification code for each patient in the EHR system, Health Management system and other healthcare applications. By authorising such an initiative, Vietnam and HCMC has provided itself with the foundations to enhance its health information system to construct a flexible and efficient digital health hub.</li> </ul>                                                                         |

|   | Legal Document                                                                                                                    | Key focused area                                                                                                                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | <b>Resolution No. 20-NQ/TW</b><br><i>On Enhancement of Citizens' Health Protection, Improvement and Care in New Situation</i>     |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>With respect to digital health, this Resolution <b>outlines the prospect of implementing EHR to strengthen healthcare service and improve accessibility for patients.</b></li> <li>The issuance of the Resolution is anticipated to <b>not only improve the efficiency of healthcare delivery but also concurrently facilitate the development of satellite clinics</b> which aim to leverage such digitisation to expand healthcare accessibility. By focusing on the acceleration of administrative healthcare to lighten the burden on hospital, this will lay the groundwork for a digital health centre, positioned to drive innovation and administrative efficiency while addressing longstanding healthcare challenges in Vietnam.</li> </ul>                                                              |
| 4 | <b>Circular No.54/2017/TT-BYT</b><br><i>On Criteria for Assessment of Information Technology Application at Health Facilities</i> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>Circular No.54/2017/TT-BYT <b>promulgated new criteria for assessment of information technology (IT) application in healthcare.</b></li> <li>The Circular also <b>provides guidance for the determination of levels of IT application at health facilities.</b> Essentially, it <b>lays a legal framework to assure quality, safety, and privacy in the application of IT in health facilities.</b> Furthermore, the guidance for IT adoption served as a <b>catalyst for health facilities to ramp up adoption of digital systems</b> able to facilitate a streamline digital healthcare experience, which will in turn set the stage for the integration of diverse healthcare services within a cohesive digital framework, deepening Vietnam's potential as a future digital health innovation hub.</li> </ul> |

|   | Legal Document                                                                                                                                          | Key focused area                                                                                                                                                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| 5 | Plan No. 2258/KH-UBND<br>On the Implementation of<br>"Digital Health Project in<br>the Period of 2021 – 2025,<br>with vision to 2030" In 2022<br>– 2023 |  Human resource<br>development<br> Healthcare<br>digitalisation | <ul style="list-style-type: none"> <li>In 2023, HCMC's DOH initiated key measures centred around digital optimisation to bolster healthcare.</li> <li>In essence, these initiatives underscore HCMC's evolution into a digital innovation hub in Vietnam. A primary focus was enhancing disease prevention, optimising the recruitment, and training of personnel for the sector's digital transformation. The goals included implementing "smart" digital strategies for monitoring, forecasting, and controlling epidemic movements. Additionally, the department aimed to improve its telemedicine system to fortify primary care health services and relieve pressure on major hospitals. To address healthcare accessibility in rural areas, specialised regional screening and early diagnosis centres were established. These centres, integrated into the broader digital healthcare framework, provide vital data for previously underserved rural populations.</li> </ul> |

|   | Legal Document                                                                                                       | Key focused area                                                                                                                                                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | HCMC DOH Strategic<br>Development Objectives in<br>Healthcare sector in 2023:<br>Synchronously deploy 4<br>key tasks |  Human resource<br>development<br> Healthcare<br>digitalisation | <ul style="list-style-type: none"> <li>Recently, HCMC's DOH has furthered its digital transformation plan, emphasising the improvement of healthcare quality.</li> <li>These initiatives are critical to serve the establishment and continual development of a digital health hub in HCMC. Particularly, they sought to digitally overhaul health administrative procedures through the employment of software able to consolidate health data into an accessible database. This process necessitated a comprehensive city-wide staff training and strategic resource allocation to dedicated IT teams, an initiative which in conjunction addresses the primary shortcoming hampering digital health adoption in HCMC. Concurrently, DOH advocates for the continuous integration of machine learning and cutting-edge digital technologies across the spectrum of digital health. these initiatives will serve to supplement the establishment and continual development of a digital health hub in HCMC.</li> </ul> |

|   | Legal Document                                                                                                                                            | Key focused area                                                                                                                                                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | <b>Resolution No. 98/2023/QH15</b><br><i>On Pilot Implementation of Particular Policies for Development of Ho Chi Minh City</i>                           |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>Released in August 2023, this Resolution sets out to specify <b>incentives applied for the operations of an innovation centre in HCMC and for HCPs.</b></li> <li>In specific, start-ups, scientific/ technological organizations, innovative centres and any intermediaries supporting the innovation are exempted from Corporate Income Tax (CIT) for 5 years from the year in which the income tax payable is generated. <b>Experts, scientists, talents and individuals who engage in the innovative activities and work in innovation centres are also eligible for a Personal Income Tax (PIT) exemption for 5 years.</b></li> <li><b>Individuals working in managerial positions are entitled to preferential incentives and salary</b> based on their expertise.</li> <li><b>The innovation centre is also eligible to receive non-refundable support from recurrent expenditures of the City Budget</b> for cost of operations, cost of hiring experts and direct labor wages.</li> <li>Innovation centres, R&amp;D centres in HCMC will also be <b>prioritised to receive investments from strategic investors</b></li> <li>The issuance of this Resolution is crucial as it helps to retain talents in the healthcare sector for the performance of the digital innovation centre.</li> </ul> |
| 8 | <b>Directive No 25 – CT/TW</b><br><i>On Continuing to Constitute, Complete and Improve the Quality of Primary Healthcare Facilities in the New Period</i> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>Directive No 25 – CT/TW <b>outlines the need to improve the quality of primary healthcare in Vietnam.</b></li> <li>Accordingly, the Directive <b>focuses on developing treatment quality in primary medical facilities by developing HCPs' skills.</b> To do so, the Directive <b>requires each primary medical facility to have at least one full-time doctor by 2030 and each village has at least one professionally trained medical staff.</b> Additionally, <b>medical facilities are required to develop suitable employee remuneration policies and welfare programs to attract qualified human resources</b> and implement effectively the rotation and mobilization of medical personnel from city/provincial-level facilities to primary healthcare facilities.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|   | Legal Document                                                                                                            | Key focused area                                                                                                                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| 9 | <b>Circular No. 03/2022/TT</b><br><b>Amendments to Some Regulations on Criteria for Title of Healthcare Professionals</b> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>In order to improve the quality of medical resources to be able to provide high-quality specialized care service, Circular No. 03/2022/TT was introduced to <b>raise the requirements for medical graduates and practitioners to be lawfully recognized as HCPs in Vietnam.</b></li> <li>Notably, <b>to be lawfully recognized as doctors</b>, besides from meeting all the technological requirements, <b>medical graduates are now also required to be able perform sufficient basic IT skills.</b> This emphasis on digital expertise is particularly significant, aiming to <b>rectify the existing challenges related to the limited IT proficiency among current doctors.</b> Consequently, this Circular holds the potential to expedite and stimulate the adoption of digital health practices within HCMC.</li> </ul> |

# Near-term initiatives

|   | Legal Document                                                                                                                                                   | Key focused area                                                                                                                                                                                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Resolution No. 24/CT-TTg</b><br><i>On Socio-economic Development and Ensuring Defense and Security In the Southeast Region by 2030, with a vision to 2045</i> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>In order to improve the healthcare development in provinces/cities located in the Southeast region of Vietnam, the Resolution <b>emphasises the importance of digitisation and innovation as key drivers of social-economic development</b></li> <li>The Resolution is critical in setting goals for <b>mobilising investments on primary healthcare facilities and national hospitals located in Ho Chi Minh City</b>. It also fosters the development of satellite hospitals.</li> </ul>                                                                |
| 2 | <b>Resolution No.31 - NQ/TW</b><br><i>On Tasks and Orientations to Development of Ho Chi Minh City by 2030, with a vision to 2045</i>                            |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>The Resolution <b>seeks to improve quality of life in HCMC through optimising healthcare administration and delivery through the use of technology</b>, with a goal to orientate digitalisation and innovation to become a healthcare centre in AEAN.</li> <li>The issuance of this Resolution <b>provides guidance and foster the development of HCMC's digital health framework by encouraging FDI and domestic investment into efforts to digitalise the industry, improve HCP quality to facilitate higher quality healthcare service.</b></li> </ul> |

|   | Legal Document                                                                                                                 | Key focused area                                                                                                                                                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 3 | <b>Decision No. 749/QĐ-TTg</b><br><i>Introducing Program For National Digital Transformation by 2025 with a vision to 2030</i> |  Human resource development<br> Healthcare digitalisation | <ul style="list-style-type: none"> <li>With regards to the digital transformation of the healthcare sector, the Government <b>has set targets to implement a centralised database for the processing, storing of patient data and make 80% of level 4 public services accessible by 2025 and 100% by 2030.</b></li> <li>Accordingly, the Decision targets to <b>establish a data platform which can facilitate data sharing between hospitals</b> to provide comprehensive data-driven health diagnosis and treatment that can later on be able to be leveraged for telehealth use, <b>expand digital economy to attract more potential users</b>. Additionally, the Decision also specifies on <b>expanding digital payment and telecommunication systems.</b></li> </ul> |

## Appendix 3. Summary of Key activities completed during the UK trip

**Saturday March 16<sup>th</sup> to Friday March 22<sup>nd</sup>**

|        | Time  | Place                                               | Activity                                                                                                                                                                                                                              | Topic                                                                                                           | Objective                                                                                                                                                                       |
|--------|-------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monday | 10 AM | Old Road Campus<br><br>Richard Doll lecture theatre | Meeting with Prof D Clifton, Institute of Biomechanical Engineering Oxford University and Translational Research Office and Oxford University Innovations<br><br>10-11: AI for healthcare<br><br>11-11.45: Scaling and sustainability | Developing AI for healthcare<br><br>Scaling and sustainability of outputs<br><br>Managing intellectual property | The objective of the meeting is to discuss the topic of developing AI for healthcare, the scaling and sustainability of outputs, as well as how to manage intellectual property |



|  |           |                                           |                                                                |                                                        |                                                                                                                      |
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|  |           |                                           | 11.45-12.30: IP and spin-outs                                  |                                                        |                                                                                                                      |
|  | 2 PM      | Nuffield Dept Medicine<br><br>Room A. CHG | Meeting with Prof R Cornall, Head of NDM, University of Oxford | Welcome greeting<br><br>How Oxford supports innovation | The objective of the meeting with Prof R Cornall is to discuss the support of Oxford for innovation                  |
|  | 3 PM      | Pandemic Science Institute (PSI)          | Meeting with Prof P Horby, Head of PSI, and team               | How innovation can help pandemic preparedness          | The objective of the meeting with Prof P Horby is to discuss the role of innovation in helping pandemic preparedness |
|  | 4.30-5 PM | Malmaison hotel meeting room              | DOH and Project team                                           | Reflections from the day                               | The end-of-day meeting aims to reflect on the discussions had with the academic                                      |

|                |              |                              |                                      |                                                                                                                                                                        |                                                                                                                                                                                                          |
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| <u>Tuesday</u> | 10 AM        | Oxford Nanopore              | Meeting with Prof Jonathan Edgeworth | Case study: research to global company<br><br>Technology in genetic sequencing (human genomics, cancer, infectious diseases)                                           | The objective of the meeting is to analyse a case study of a global company and discuss technology in genetic sequencing with a focus on human genomics, cancer, and infectious diseases                 |
|                | 2 PM         | Kadoorie Institute           | Meeting with Prof Peter Watkinson    | Developing technology alongside clinical practice<br><br>Developing low-cost wearable technologies<br><br>Remote monitoring<br><br>Automated electronic health records | The objective of the meeting with Prof Peter Watkinson is to explore the development of technology alongside clinical practice and to examine the development of other viable technologies in healthcare |
|                | 4.00-4.30 PM | Malmaison hotel meeting room | DOH and Project team                 | Reflections from the day                                                                                                                                               | The end-of-day meeting aims to reflect on the discussions had with the academic                                                                                                                          |

|  |      |                 |                                                                                                 |                                               |                                                                                          |
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|  | 6 PM | Linacre College | Linacre College meeting with the College Principal and members of the Oxford Vietnamese Society | Welcome to Linacre College<br>Tour of College | The objective of the meeting is to get to know the academic community in Linacre College |
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| Wednesday | 11 AM   | BMA House, Tavistock Sq. | Meeting with Ashley McKimm, British Medical Journal Partnerships/ BMJ Innovations<br><br>Meeting with Holly Edwards, BMJ Future Health | BMJ Future Health Initiatives<br><br>BMJ-Vietnam work promoting education and innovation                                               | The objective is to study future health initiatives and discuss the collaboration between BMJ and Vietnam to promote education and innovation                                                |
|           | 2 PM    | Wellcome Trust           | Meeting with Julia Kemp                                                                                                                | How Wellcome invests in Vietnam and how Wellcome supports innovation and development of healthtech in low- and middle-income countries | The objective of the meeting is to discuss the potential of Wellcome's investment in Vietnam and Wellcome's support for innovation and health technology in low- and middle-income countries |
|           | 3.30 PM | Wellcome Trust           | Meeting with EZRA. Jason Goodman and Emi Gal                                                                                           | Case study on new company: AI to detect cancer. How this is supported in the UK and US                                                 | The objective is to examine the case study on AI detecting cancer and how it is supported in the UK and US                                                                                   |

|          |         |                                                    |                                                                                |                                                                                                                                                                                                        |                                                                                                                                                                                          |
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| Thursday | 9.45 AM | University of Surrey medical school                | Meeting with Prof Juliet Wright (Dean of Medical School)                       | <p>Innovation in medical teaching</p> <p>Employing technology in medical educations</p> <p>Life-long mentorship and learning for medical professionals</p> <p>Career support for medical workforce</p> | The objective of the meeting with Prof Juliet Wright is to discuss the matter of integrating technology into medical teaching and the support for medical professionals in the workforce |
|          | 3 PM    | Michael Page, 2 <sup>nd</sup> floor, 80 the Strand | Meeting with Ian Gibbons and Ken Wells and UK-ASEAN partnership for technology | Round table discussion with invited experts on various aspects of health technology, including primary care, surgery, policy, human resources                                                          | The objective is to discuss various aspects of health technology with experts                                                                                                            |

|        |              |                                            |                                                                  |                                                                                                                                                                                                                       |                                                                                                                                       |
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| Friday | 10 AM        | St. Thomas' Hospital/King's College London | <p>Meeting with Prof R Razavi</p> <p>Meeting with Dr S Giles</p> | <p>Technological innovation alongside clinical practice (focus on imaging)</p> <p>Implementing innovation in clinical practice, whilst maintaining an imaging service</p> <p>Case study: spin out company imaging</p> | The objective of these meetings is to study technological innovation in imaging practice and examine a case study on imaging spinouts |
|        | 1.30-2.30 PM | Park Plaza Hotel meeting room              | James Paget meeting (arranged by FCDO)                           |                                                                                                                                                                                                                       | The objective of the meeting is to discuss healthcare related matters with experts                                                    |

## List of Delegates

| No | Name                                | Title & Email Address                                                                                | Short Bio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Photo                                                                                |
|----|-------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1  | <b>Assoc. Prof. Tang Chi Thuong</b> | Director, Ho Chi Minh city Department of Health<br><br>Email:<br>tcthuong.syt@tphcm.gov.vn           | Assoc. Prof. Tang Chi Thuong previously worked at Nhi Dong 1 Hospital as a medical doctor, Department Head, Vice Director, and Director. He has been the of Director of Ho Chi Minh City's Department of Health since November 2021.                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| 2  | <b>Dr. Nguyen Hai Nam</b>           | Deputy Chief of Office, Ho Chi Minh city Department of Health<br><br>Email:<br>nnguyen.hcm@gmail.com | Having a background of an oncologist surgeon, Dr. Nam has been contributing to Ho Chi Minh City's cancer prevention, cancer registry system, and cancer research since 2004. He specialised in Head and Neck Cancer Surgery and was one of the pioneers in minimising invasive endoscopic Thyroid surgery at Ho Chi Minh City Oncology Hospital, as well as one of two Vietnamese members of the APTS (Asia-Pacific Society of Thyroid Surgery). As of 2022, he was promoted to a new position as the Deputy Chief of Office, with duty on international collaborations, external relations, healthcare innovation team of the HCMC Department of Health. |  |

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| 3 | <b>Dr. Luong Chan Lap</b> | Deputy Head of Financial Planning Department, Ho Chi Minh city Department of Health<br><br>Email:<br>drluong84@gmail.com | Dr. Lap and the department are responsible for proposing, developing, and implementing programs and plans to manage the Ho Chi Minh City Department of Health's annual activities. Dr. Lap has also contributed to the long-term development strategies for the city's health sector. |  |
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| 4 | <b>Le Thi Thuy Quynh</b>    | Executive, IT Department, Ho Chi Minh city Department of Health<br><br>Email:<br>littquynh.syt@tphcm.gov.vn          | The responsibilities of Ms. Quynh involve building and implementing IT applications for Ho Chi Minh City's healthcare system.                                                                                                                                                                                                                                                                                                  |   |
| 5 | <b>Pham Thi Le Diem</b>     | Executive, Department of Medical Services, Ho Chi Minh city Department of Health<br><br>Email:<br>bslediem@gmail.com | Ms. Diem worked at District 4 Hospital from 2012 to 2021. She began her new post as Executive in the Department of Medical Services at the DOH in November 2021.                                                                                                                                                                                                                                                               |  |
| 6 | <b>Dr. Luong Thanh Tung</b> | Vice Director, Binh Dan hospital Email:<br>luongthanh tung2011@gmail.com                                             | Dr. Tung is the Vice Director in charge of General Surgery at Binh Dan Hospital. He has managed the Diagnostic Imaging, Gastrointestinal Endoscopy, Supplies and Equipment, and Information Technology departments. He is also in charge of the adoption and implementation of electronic medical records at Binh Dan Hospital. He was awarded the Certificate of Merit by the City People's Committee and the Prime Minister. |  |



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| 7 | <b>Dr. Nguyen Thi Thanh Huong</b> | Vice Director, Nhi Dong 1 hospital<br><br>Email:<br><a href="mailto:huongnt@nhidong.org.v">huongnt@nhidong.org.v</a><br><a href="#">n</a>       | Dr. Huong currently serves as the Head of Neonatal Department 2 at Nhi Dong 1 Hospital. She has been the Vice Director of Nhi Dong 1 Hospital since October 2023.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| 8 | <b>Dr. Mai Phan Tuong Anh</b>     | Head of General Planning Department, Gia Dinh People's hospital<br><br>Email:<br><a href="mailto:mptuonganh@gmail.com">mptuonganh@gmail.com</a> | Dr. Anh oversees all medical aspects of Nhan dan Gia Dinh's operations, including internal regulation, medical files, patient outcome management, and clinical research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| 9 | <b>Prof. Guy Thwaites</b>         | Director, OUCRU Email:<br><a href="mailto:gthwaites@oucru.org">gthwaites@oucru.org</a>                                                          | Prof. Guy is a professor of infectious diseases at the University of Oxford. He is a clinician graduated from Cambridge University and from the United Medical and Dental Schools of Guy's and St Thomas' Hospitals. He also studied Infectious Diseases and Microbiology in Brighton and was trained at the Oxford University Clinical Research Unit (OUCRU) in Vietnam, Imperial College London, and the Hospital for Tropical Diseases in London. His research interests focus on the management of severe bacterial infections, particularly those affecting the central nervous system. He serves on advisory committees for the WHO, the Australian, and the United Kingdom |  |

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|    |                              |                                                                                                                       | governments. He has been the Director of OUCRU based in Ho Chi Minh City since 2013.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                       |
| 10 | <b>Prof. Louise Thwaites</b> | Senior Clinical Research Fellow, OUCRU Vietnam<br>Email: <a href="mailto:lthwaites@oucru.org">lthwaites@oucru.org</a> | Prof. Louise is a clinical researcher and a member of OUCRU's Emerging Infections group. She is an Associate Professor of the Centre for Tropical Medicine and Global Health at the University of Oxford. She is an expert consultant for the World Health Organisation and a member of the European Society of Intensive Care Medicine's sepsis in resource-limited settings-expert consensus recommendations group, as well as CRITICAL CARE Asia (Collaboration for Research, Implementation & Training in Intensive CARE in Asia). Prof. Louise is a member of the steering committee at the Asia Pacific Sepsis Association, and she leads the guidelines, policy, and quality working groups. |    |
| 11 | <b>Prof. Le Van Tan</b>      | Head of Emerging Infections, OUCRU Vietnam<br>Email: <a href="mailto:tanlv@oucru.org">tanlv@oucru.org</a>             | Prof. Tan is an Associate Professor at the University of Oxford and the Head of OUCRU Emerging Infections group. His goal is to build local and national expertise in Vietnam and the neighbouring region so that current and future infectious disease concerns can be addressed from within the                                                                                                                                                                                                                                                                                                                                                                                                   |  |

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|    |                         |                                                                                                                                                                                                     | <p>affected regions and populations. His early research concentrated on pathogen discovery, which resulted in the identification of a novel cyclovirus in 4% of Vietnamese patients with encephalitis. He is currently funded by NIH to investigate novel causes of sepsis in Southeast Asia.</p>                                                                                                                                                                                                                                                                                                                        |                                                                                       |
| 12 | <b>Dr. Lam Minh Yen</b> | <p>Senior Study Doctor, OUCRU Vietnam</p> <p>Email: <a href="mailto:yenlm@oucru.org">yenlm@oucru.org</a></p>                                                                                        | <p>Dr. Yen, MD, conducts clinical research on vaccine-preventable and emerging infections, as well as critically ill patients with infectious diseases such as tetanus, diphtheria, hepatitis, rabies, influenza, dengue fever, and sepsis. She is especially interested in long-term functional improvement for severe patients via rehabilitation and innovation programmes.</p> <p>Dr. Yen was the previous Vice-Director of HTD in HCMC. Dr. Yen was named an <a href="#">Australian Alumni Ambassador</a>, one of only 12 chosen by the Australian Government from a global network of over 2.5 million alumni.</p> |    |
| 13 | <b>Luke Treloar</b>     | <p>Partner, Head of Strategy, National Head of Healthcare &amp; Life Sciences, KPMG Tax and Advisory Limited</p> <p>Email: <a href="mailto:luketreloar@kpmg.com.vn">luketreloar@kpmg.com.vn</a></p> | <p>Mr. Luke is a strategy consultant at KPMG Vietnam with strong experience in emerging and frontier markets. Throughout his consulting career, he has been in charge of designing, developing, and implementing high-profile, profitable, and mission-critical solutions for global Fortune 500 companies. This comprised market</p>                                                                                                                                                                                                                                                                                    |  |

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|    |                          |                                                                                                                                                                                      | entry, expansion strategy, and acquisition target assessments throughout Asia. Mr. Luke co-chairs the AmCham Vietnam Healthcare Committee and is on the Board of Governors for the chamber's Danang chapter.                                                                                                                                                                                                                                                                               |                                                                                       |
| 14 | <b>Vo Thi Kim Ngan</b>   | <p>Director, Strategy Department, KPMG Tax and Advisory Limited</p> <p>Email: <a href="mailto:nganvo@kpmg.com.vn">nganvo@kpmg.com.vn</a></p>                                         | <p>Ms. Ngan's work entails providing strategic consulting services to global and domestic clients in a variety of industries, including market entry, growth strategy, and merger and acquisition strategy. Ms. Ngan has advised various clients from the United Kingdom, the United States, South Korea, Japan, and Southeast Asia on how to invest and trade in Vietnam. Her primary focus areas include Healthcare &amp; Life Sciences, FMCG, Financial services and Manufacturing.</p> |    |
| 15 | <b>Pham Thi Hong Van</b> | <p>External Relations Officer, British Consulate General in Ho Chi Minh City, Vietnam</p> <p>Email: <a href="mailto:Pham.ThiHongVan@fcdo.gov.uk">Pham.ThiHongVan@fcdo.gov.uk</a></p> | <p>Ms. Van's mission is to supervise the British Consulate General's engagements with local authorities in Southern Vietnam's cities and provinces, facilitating the UK's collaboration with public and private partners in a variety of disciplines such as Health, Finance, Education, Trade, and Investment.</p>                                                                                                                                                                        |  |

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| 16 | <b>Vuong Thai Duy</b> | Trade Manager (Healthcare), British Consulate General in Ho Chi Minh City<br><br>Email: <a href="mailto:Vuong.ThaiDuy@fcdo.gov.uk">Vuong.ThaiDuy@fcdo.gov.uk</a> | Mr. Duy, along with his colleague at the British Embassy in Hanoi, collaborates with UK and Vietnamese stakeholders to foster exports and improve market access to Vietnam's rapidly expanding healthcare market. |  |
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## Key learning insights from the UK trip

### 1. Oxford Innovation Ecosystem

The delegates visited Oxford University Innovation (OUI), one of the most successful innovation research centres integrated within university campuses, to gain valuable insights into the innovation ecosystem and, notably, explore the spinout models in the UK. Spinout companies are established on science and technology research owned by universities and researchers, with the objective of commercialising innovative research products to create more clinical treatments from scientific discoveries. Since 1959, OUI has formed over 300 spinouts, and one of its most successful spinout companies is Oxford Nanopore Technologies, a leading firm in DNA/RNA sequencing technology that offers rapid real-time analyses, from portable to large-scale sizes, at an affordable cost. OUI provides scientists and students with support in various forms, such as patent protection, advice on the commercialisation of scientific products, product exhibitions, and finding and managing funding sources for startup creation based on science and technology research. Simultaneously, OUI establishes many research centres within hospitals and care facilities to facilitate clinical trials and evaluate the outcomes of integrating new innovations to improve the quality of healthcare in the UK.

**The visit to the Oxford Innovation Ecosystem provided the delegates from HCMC with valuable insights into innovative solutions for current healthcare services and the development of research and clinical practices to enhance patient care quality. Collaboration between academia, industry, and government bodies is critical to the success of the Oxford Innovation Ecosystem, which suggests HCMC leverage existing resources to create effective networks for healthcare innovation.** In addition, public and private investments are needed to establish research hubs and spinout businesses. Lastly, the involvement of patients throughout the digital innovation process helps build efficient technologies that can reflect public needs.

### 2. Funding Models

The success of the healthcare digitalisation model in the UK relies heavily on the available financial capital, and searching for funding is a crucial element throughout the process. During the trip to the UK, the delegates from HCMC gained an understanding of funding models that have been applied to the development of the UK's digital health. To foster innovation in digital health, the UK prioritises the diversification of funding sources, forming partnerships between public and private stakeholders to make more financial capital available.

**One of the most significant models is PF2, previously known as the Private Finance Initiative (PFI), which is a form of public-private partnership (PPP).** The private sector provider is responsible for the financing and operating activities throughout the construction, including all associated risks. Therefore, the public entity does not pay for the asset during construction but instead pays a "unitary charge" to use the infrastructure. As of March 31, 2023, there were 176 out of 669 PFI projects focusing on hospitals,



acute health, and social care, which accounted for a total capital value of GBP14.1 billion. A remarkable case study of an ongoing project is the Barts and the Royal London Hospitals project, which accounts for approximately GBP1.1 billion. This project involves the construction of new care centres and the refurbishment of retained estates, transforming Royal London into Britain's most prominent new hospital with clinically renowned services and creating a cutting-edge Cancer and Cardiac Centre of Excellence from the Barts. However, in 2018, the government cancelled the practice of PFI and PF2 for new projects as it was considered inflexible, overly complex, and posing significant fiscal risk to the government.

**Another common model is joint ventures (JV), where two or more organisations form a new structure with shared equity and governance, leveraging economies of scale.** One example of successful implementation is Viapath LLP, a partnership between Guy's and St Thomas' NHS Foundation Trust, King's College Hospital NHS Foundation Trust, and SYNLAB UK & Ireland to drive innovation and modernisation in pathology services. One limitation of establishing the JV model is that it involves sharing both profits and risks whether a project fails or not, and the resources that could have been spent directly on healthcare might be drained.

In addition, the NHS has created contracts with Integrated Care Providers (ICP), aiming to bring together a number of service providers under one umbrella. This umbrella organisation will take responsibility for the cost and quality of care for a defined population of up to 500,000 within a particular area on an agreed-upon budget. An instance of this partnership form is Northumbria Healthcare NHS Foundation Trust, which was one of the first ICP contracts in the United Kingdom. The model integrates hospitals, GP facilities, community health, mental health, and social care services, focusing on delivering preventative and proactive care to the population. A possible shortcoming of this model is that the failure of ICP service may cause disruptions in the continuity of care for patients.

The partnership with the private sector allows the UK to leverage financial and other resources to accelerate the development and digitalisation of the national healthcare system. The three models mentioned have resulted in numerous new and renovated care facilities across the country, allowing better integration of new technologies for better healthcare quality. It is suggested that Vietnamese delegates should refer to the examples set by the PPP models in the UK and utilise current resources available in Vietnam to foster the development of healthcare innovation.

### 3. Human Resources Development

During the UK trip, the delegates visited the University of Surrey, where they exchanged knowledge on the development of human resources in healthcare. With a focus on innovation in medical education, the group delved deep into the advantages of employing technology in training healthcare professionals. Additionally, the topic of life-long mentorship was explored in depth, providing valuable insights into the crucial support needed for medical professionals throughout their academic and career paths.

The visit to the University of Surrey introduced the delegates from HCMC to new ideas to enhance the city's healthcare training, fostering the development of digital healthcare in HCMC. **The implementation of technology in medical training creates more engaging and interactive learning experiences for students, bridging the gaps in expertise between HCPs.** Furthermore, innovative training empowers new medical graduates with technological skills, increasing opportunities for the equal integration of healthcare innovation technologies across care facilities. On the other hand, **the life-long support for HCPs fosters their professional development, providing professionals with resources and guidance.** This results in increased job satisfaction and reduced burnout rates, ensuring a sustainable supply of human resources in healthcare and enhancing the quality of care delivery. In conclusion, through the implementation of technology and the provision of mentorship, the HCMC healthcare sector can better prepare and supply adequate human resources for digital healthcare innovation. The University of Surrey has set a benchmark for healthcare education, inspiring HCMC to follow suit in promoting digital healthcare innovation and securing better healthcare outcomes for patients.

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