

ITEM FOR FINANCE COMMITTEE

CAPITAL WORKS RESERVE FUND

HEAD 710 – COMPUTERISATION

Government Secretariat: Food and Health Bureau (Health Branch)

New Subhead “Development of a Territory-wide Electronic Health Record Sharing System”

Members are invited to approve a new commitment of \$702,000,000 for implementing the first stage of the territory-wide Electronic Health Record Development Programme.

PROBLEM

Presently in Hong Kong, health-related and medical data of individuals are usually created and kept by different healthcare providers at different locations (e.g. at doctors' clinics and hospitals) in different formats (mostly in paper form and some in electronic form without sharing capability). The lack of an information infrastructure for sharing of such data among healthcare providers (subject to the patients' authorisation and consent) hinders development of patient-centred healthcare and provision of continuous primary care, and presents obstacles to interface between hospitals and primary care providers and partnership between the public and private healthcare sectors.

PROPOSAL

2. The Secretary for Food and Health (SFH), with the support of the Government Chief Information Officer (GCIO), proposes to create a new commitment of \$702,000,000 for the first stage of the Electronic Health Record (eHR)¹ Development Programme (from 2009-10 to 2013-14) aiming to have the

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¹ An electronic health record is a record in electronic format containing an individual's health-related data stored and retrieved for health-related purposes. It encompasses general personal particulars, personal health-related information as well as medical records from different sources and locations.

eHR sharing platform ready by 2013-14 for connection with all public and private hospitals, and to have electronic medical/patient record (eMR/ePR) systems² and other health information systems available in the market for private doctors, clinics and other health service providers to connect to the eHR sharing platform.

JUSTIFICATION

eHR Sharing System as Essential Healthcare Infrastructure

3. The proposal to develop a territory-wide patient-oriented eHR sharing system³ has been put forward as part of the proposals in the Healthcare Reform Consultation Document “Your Health, Your Life” published in March 2008. The system will enable sharing of medical records of patients between healthcare providers in both the public and private sectors subject to the patients’ consent. The proposal received broad support from the community among other service reform proposals during the consultation. The eHR sharing system provides an essential infrastructure for implementing the healthcare reform in the following ways –

- (a) **Enable patient-centred healthcare** – eHR sharing system allows timely sharing of essential and comprehensive medical information of patients. It provides a vital infrastructure for facilitating a seamless healthcare process under which different healthcare providers provide collaborative care centred around the individuals and their health and well-being, which is a key objective of healthcare reform.
- (b) **Enhance primary care** – eHR sharing system builds up lifelong records for individuals contributed to and accessible by different healthcare providers. It provides an essential tool for comprehensive, lifelong and holistic primary care for individuals, helps promote the family doctor concept and continuity of care, and enables patients to take greater ownership and control of their health record, and in turn their health; and

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² Electronic medical/patient record (eMR/ePR) systems are information systems deployed by individual healthcare providers for storing their patients’ medical records for their own healthcare purposes. Such systems do not automatically or necessarily provide sharing capabilities. Sharing of eHR by such systems will require compliance with set standards and protocols for sharing and connection to a sharing platform based on such standards and protocol for interconnecting other eMR/ePR systems similarly equipped.

³ In technical terms, a eHR sharing system comprises standalone electronic medical/patient record (eMR/ePR) systems, which are information systems deployed by individual healthcare providers for storing their patients’ medical records for their own healthcare purposes, and a central electronic platform as the sharing infrastructure for such eMR/ePR systems to interconnect for sharing of eHR amongst them.

- (c) **Facilitate hospital-primary care interface and public-private partnership** – eHR sharing system connects hospitals and primary care practitioners, and the public and private healthcare sectors. It facilitates better collaboration and interface between different healthcare providers and between different levels of care, and enables patients to receive public and private services at different times without worrying about the transfer of their medical records.

The eHR Programme

4. The eHR is a ground-breaking concept introducing a whole new infrastructure operated by the Government for holding and transferring individual patients' personal health data. It enables the entry, transfer and retrieval of such data by different healthcare providers in both the public and private sectors, with procedures for obtaining consent and authorisation by patients, and mechanisms for authenticating and controlling access to such data. It will also bring in new ways of providing healthcare through collaboration between healthcare providers, as well as new technical platforms and standards for information technology (IT) in healthcare. It also raises new challenges on data privacy and security protection.

5. The eHR sharing system is a new infrastructure for healthcare services. It is much more than an IT project and requires us addressing not only technical IT issues, but more importantly legal, privacy and security issues including ownership, access and copyrights of patient records and the safeguarding of data privacy and security, and institutional issues including governance of the future eHR sharing infrastructure holding and transferring a vast amount of health data of the majority of the population. Above all, we must engage the public and private healthcare sectors as well as other stakeholders in the development process to ensure their ownership and support for the system and the changes that the system will bring about to the way that healthcare services are delivered. Close collaboration with the private healthcare sector is required from the outset.

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6. It is in recognition of these challenges that SFH established in July 2007 the Steering Committee on eHR Sharing (the Steering Committee) comprising healthcare professionals from both the public and private sectors. Through close collaboration between the public and private sectors and after a year of intensive work, the Steering Committee put forward in July 2008 its initial recommendations for an eHR programme. Based on these initial recommendations, Food and Health Bureau (FHB) has formulated the eHR Programme, a roadmap for eHR development over a 10-year planning horizon, reflecting consensus on key issues reached among healthcare professional, inter alia, as follows –

- (a) **Government-led eHR development:** to handle the complex development of eHR involving multitude of healthcare providers and sensitivity of personal health data, the Government should take a leading role at the formative stage, and deploy dedicated staffing and funding resources to spearhead and co-ordinate the eHR programme on a continuous basis, with a view to ensuring coherent eHR development in both the public and private sectors. At the same time, the Government should leverage the successful experience and invaluable expertise accumulated within the public sector, in particular the Hospital Authority (HA) in developing its Clinical Management System (CMS), and make available HA's systems and know-how to the private sector for developing sharing-capable eHR systems.
- (b) **Data privacy, system security and legal framework:** data privacy and system integrity and security are of paramount importance in development of the eHR sharing system. To this end, FHB would conduct, in collaboration with the Office of the Privacy Commissioner for Personal Data and the Office of the GCIO and engaging consultants as necessary, Privacy Impact Assessment, Privacy Compliance Audit, Security Risk Assessment and Security Audit, covering a wide range of issues. The long-term legal protection for data privacy and system security would also require exploration and formulation of a legal framework, having regard to current legislative provisions applicable to personal health data and overseas experience.
- (c) **Voluntary participation in eHR sharing:** developing an eHR sharing system does not imply that all health data of every citizen would be automatically shared with every healthcare provider. Participation in eHR sharing by patients and healthcare providers will be on voluntary basis. Only data falling within pre-defined scope of eHR would be sharable on the patient's informed consent to

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participate and authorisation for individual healthcare providers to access their shared eHR. Healthcare providers too may choose whether to join the system. To make eHR sharing attractive, we will consider creating incentives for healthcare providers to participate, e.g. to use eHR for various subsidised healthcare schemes and public-private-partnership projects.

- (d) **Open and common standards and protocols:** the eHR sharing system will be based on open, pre-defined standards to ensure inter-operability. The sharing of health data through the eHR sharing platform will also be based on pre-defined security standards and communication protocols to ensure integrity and security of the eHR sharing system and to safeguard the privacy and security of the data. The Government will develop these standards and protocols in collaboration with healthcare professionals and other stakeholders in both the public and private sectors, and promote them among IT vendors and healthcare providers.
- (e) **Engagement of private sector and general public:** the participation by healthcare providers, IT service providers and other stakeholders in the private sector, as well as the general public, in the eHR development process is essential to ensure its successful deployment in the private sector and acceptance by the community. To this end, the Government would launch an eHR Engagement Initiative (EEI) with all relevant stakeholders, and invite them to submit proposals on possible partnership projects that could facilitate the development and deployment of eMR/ePR systems and contribute to eHR sharing in the private sector. At the same time, the Government would also initiate consultation on specific eHR issues especially those affecting data privacy and legal protection, e.g. consent model and access control based on the principle of voluntary participation.

The eHR Programme Management Plan

7. In a programme of this scale, there will be a need to prioritise deliverables and fine-tune scope in order to respond to needs and issues that emerge during engagement with the public, the medical sector and with suppliers. We have commissioned an independent consultant with extensive programme management expertise to assist in formulating a Programme Management Plan (PMP) for implementing the eHR Programme. The PMP covers a wide range of issues, including the detailed plan with high-level development roadmap with execution strategy, programme organisation, mechanisms on project governance, and the

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functional roles and organisational setup to carry out the various tasks under the eHR Programme. The PMP has also validated the estimated capital cost for the eHR Development Programme over a ten-year planning horizon. It also includes a rigorous governance mechanism for programme-level change control and for the initiation of specific projects. This will enable the programme scope and cost allocation to be adjusted as necessary to maximise benefits to the community.

The eHR Components

8. Under the eHR development roadmap, the development of the eHR sharing system will be divided into the following three major eHR components –

- (a) **The eHR sharing infrastructure core component:** to design and build the core eHR sharing platform for interconnecting between individual eMR/ePR systems adopted by individual healthcare providers, and providing functions relating to eHR sharing, including storage and exchange of data between individual systems, and access to and retrieval of eHR data of individual patients in different individual systems, including systems for patient and provider identification as well as consent for access. The system will be based on common standards to be developed by the public and private sectors in collaboration.
- (b) **The CMS adaptation and extension component:** to facilitate the adoption and deployment of HA's CMS by private healthcare providers, especially private hospitals/clinics which would like to adopt HA's CMS components for their own use with minimal investment and maintenance. This component will facilitate the deployment of eHR systems by IT vendors in private hospitals, private practitioners and healthcare providers which intend to adopt and use the HA systems. This component will be implemented predominantly through private participation, e.g. we may license adapted and extended components and technologies of HA's CMS to private healthcare providers and/or IT vendors for their further development and implementation.
- (c) **The standardisation and interfacing component:** to develop technical standards for different healthcare IT systems to interoperate and interconnect through the eHR sharing infrastructure, to advance a validation platform for testing interoperability that could support a future certification scheme for individual eMR/ePR systems of

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healthcare or IT service providers, to provide technical support for private healthcare providers which already have their own eMR/ePR systems and would like to connect to eHR, and to provide the necessary interface to facilitate such interconnection. This component will facilitate the deployment of eHR systems by private hospitals, private practitioners and other healthcare providers which intend to use their own systems while ensuring compatibility with the sharing infrastructure and interoperability with other eHR systems.

Encl. 1 The technical scope of the three major eHR components is set out at Enclosure 1.

Hospital Authority as the Technical Agency for FHB

9. Since 1995, HA has progressively developed its CMS for storing and retrieving patients' medical records. The CMS has already gone through its Phases I and II development with an accumulative investment of \$1,420 million over 14 years. Up to now, the CMS is the largest scale integrated eMR/ePR system in Hong Kong, and probably one of the most advanced and successful systems of its kind in hospitals around the world, in terms of coverage, functionalities and complexity. It has accumulated the medical records of over eight million patients, 800 million laboratory results, 340 million prescriptions and 34 million radiological images, covering virtually all clinical services provided by HA hospitals and clinics (with the main exception of medication order in in-patient wards).

10. The current CMS is a well-developed IT infrastructure within HA, providing shared access to patient records to any authorised personnel within HA, and is an indispensable tool tightly integrated into the day-to-day delivery of healthcare service by clinicians and other healthcare professionals in HA with over three million transactions per day. However, sharing of clinical data beyond HA with other healthcare providers is limited by both system design and capacity. In order to enable its extension and adaptation for application in the private sector and to facilitate sharing of patient records with other healthcare providers in future, the CMS is currently in its Phase III development.

11. Given that the CMS is the largest scale of integrated local eMR/ePR system, it will be one of the main pillars to the eHR sharing infrastructure. To ensure cost effectiveness in the development of the eHR sharing infrastructure, to facilitate development and deployment of eMR/ePR systems by private healthcare providers, and to enable the interconnection of individual eMR/ePR systems with

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the eHR sharing infrastructure, the HA's expertise and know-how in the development of CMS is a crucial asset to be leveraged upon. In line with its functions, the HA will serve as the agency for FHB on eHR development. Specifically, HA will provide technical advice and support to the Government on the eHR Development Programme, and will set up dedicated teams for undertaking the implementation of the eHR components in paragraph 8 above.

12. It should be noted that while HA will serve as the technical agency to the Government, a substantial portion of the services, apart from hardware and supplies, will be sourced from the private sector providing business opportunities for the private sector particularly small and medium enterprises wherever feasible. In this regard, the PMP recognises that around two-third of the eHR Development Programme capital budget will be in areas of purchasing hardware and software, procuring IT operational services (such as data centre and network services), hiring contractors and supplementary IT contract staff, outsourcing certain work assignments to the private IT sector, and contracting system integration and development services, vast majority of which will be on the IT industry. This figure has yet to include the expenditure by private sector parties on developing and implementing their individual eHR systems. Most of the expenditure by the private sector will be awarded locally and will present opportunities for small and medium enterprises.

13. The development of a territory-wide eHR system and the servicing and maintenance of such would require development of the relevant expertise in the private sector. In particular, given that lack of systems in Hong Kong or indeed other parts of the world of similar scale and scope as HA's CMS, the direct transfer of knowledge is essential and would be the most cost-effective and efficient way of building up capacity of the private sector in support of the initiative. As mentioned in paragraphs 16 to 18 below, the EEI will also be launched to enable more private sector players to participate in this Government-led initiative. The arrangements as advised by the Steering Committee on eHR Sharing represented a considered view on the appropriate balance between leveraging the HA's expertise and know-how, and ensuring private participation through the EEI in supporting the eHR development.

14. The eHR Development Programme will also create opportunities for the private sector to develop eHR-compatible systems for private hospitals and clinics. The programme will facilitate this by promulgating open standards for eHR compatibility, by providing technical assistance to private contractors, by certifying privately-developed software for eHR compatibility, and by licensing software modules for re-use in private sector implementations. To the extent that HA, in

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performing its tasks in the course of eHR development, needs to procure services from the private sector, HA will follow the established requirements and procedures in the relevant procurement regulations, including pre-qualification and tendering as applicable to ensure openness and avoid conflict of interests.

15. The HA, through its HA Information Technology Services (HAITS) section as the technical agency, will be tasked to undertake multiple streams of work projects to support the eHR Development Programme. In order to ensure the delivery of the functionalities of eHR components according to the development roadmap, HAITS will set up an eHR Programme Management Office (eHR PMO) to carry out all eHR related matters and projects. Through the eHR PMO, HAITS will report to FHB, specifically the eHR Programme Steering Committee (eHR PSC) and the eHR Office to be established under FHB, on matters relating to the eHR Development Programme. Funding for eHR-related projects to be implemented by HAITS will be budgeted and accounted for separately from other public healthcare services delivered by HA. Specific scrutiny processes and approval procedures for budget, accounting, work plans, programme deliverables and manpower plan will be established between the eHR Office and HAITS. Arrangements for periodic report on implementation progress, expenditure situation and other relevant issues will also be established.

The eHR Engagement Initiative

16. As mentioned in paragraph 6(e) above, participation by the private sector in the eHR development process is essential. Specifically, the eHR sharing system will require the deployment of eMR/ePR systems by private healthcare providers with capabilities of sharing eHR of individual patients based on commonly adopted standards, a secure electronic platform in a secure, identifiable and intelligible manner. Given the importance of participation in eHR development by private healthcare providers, IT service providers and other stakeholders in the community, and in order to support all three eHR components in the development roadmap involving the private sector, we intend to launch an eHR EEI with all relevant stakeholders. An outline of the EEI is set out at Enclosure 2.

Encl. 2

17. We will conduct an open exercise to invite interested private healthcare providers, IT service providers and relevant stakeholders to submit proposals on possible partnership projects that could facilitate the development and deployment of eMR/ePR systems and contribute to eHR sharing in the private sector. The purpose of the exercise is to help us identify potential partners and partnership projects under different possible partnership models that could further the objective of eHR development. As part of the EEI, we will also be promoting the concept of eHR sharing among the general public including patients and

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healthcare providers, through both pilot projects involving eHR sharing and other patient-centred healthcare programmes using eHR as a vehicle. Our ultimate aim is to drive the development of a patient-oriented eHR sharing system where the patient will have greater control of and access to their own health records and in turn their own health.

18. A majority of the development and implementation work under the eHR components is expected to be delivered through partnership projects with private sector through EEI. Partnership projects may include, for instance, innovative ways of building the common sharing platform or specific solutions for it, collaborative efforts to deploy the adapted and extended CMS to private hospitals or clinics, validation or certification platform for common eHR standards, and interfacing with established eMR/ePR systems or solutions in the private sectors. These will contribute to the development of individual eMR/ePR systems in the private sector, their interoperability and standardisation both technically and systemically, their interfacing with the eHR sharing infrastructure, and above all their adoption by private hospitals, private practitioners and other healthcare providers. Projects meeting the EEI objectives will be funded through the capital funding allocated to the three respective eHR components set out in paragraphs 25 and 26 below, subject to the principles set out in paragraphs 19 to 21 below.

The Government's Commitment to eHR Development

19. The development of the eHR sharing system requires substantial investment in the public sector. Since the system is an essential infrastructure for healthcare services and implementation of the healthcare reform, Government's investment in the development of this infrastructure and commitment to its recurrent operation and maintenance is necessary. Subject to the approval of the current proposal by the Finance Committee, the Government will provide capital funding for the three eHR components in the development roadmap as set out in paragraph 8 above, and fund the recurrent cost of operating and maintaining the eHR sharing infrastructure. Separately, Government will continue to provide funding support for the development of eHR systems in the public sector, specifically those within HA and Department of Health (DH) as users of the eHR platform, through established mechanism.

20. Apart from development projects that the Government will directly commission on its own, we envisage that many development efforts will also take place through partnership with private healthcare providers, private IT service providers and relevant stakeholders through EEI (see paragraphs 16 to 18 above on engagement of private stakeholders). As a general principle, under such

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partnerships, the Government will provide capital funding only in respect of the components that fall within the eHR sharing infrastructure set out in the eHR roadmap as described above. The private sector partners (whether non-profit-making or otherwise) will remain responsible for their own hardware and software (except eHR systems, applications and platform offered by the Government for direct use, deployment, adaptation or customisation by private sector), and recurrent operating costs for their own eMR/ePR systems without Government direct subsidy.

21. The Government may also provide assistance on eHR development to the private sector in the form of (i) making available the public sector systems including any standards, modules, components and technology through licensing for local use; (ii) providing development assistance and other technical advice for interfacing including any necessary modifications or upgrading of existing systems; (iii) undertaking standardisation and any associated work necessary to make the standards available for use by private stakeholders for their own eMR/ePR systems; and (iv) providing financial support to eHR projects by non-profit-making professional bodies which would make solutions available through open source or in other not-for-profit manner to the local sectors.

ANTICIPATED BENEFITS

22. An eHR sharing system provides an information infrastructure for healthcare providers in both the public and private healthcare sectors, with informed consent of the patient and proper authorisation for access to the system, to share the eHR they keep on the patient with other healthcare providers and to retrieve the eHR of the patient shared by other healthcare providers. The PMP acknowledges that the eHR development programme will deliver a host of intangible benefits in outcomes. The intangible benefits will have a financial impact, albeit non-measurable, in terms of the economic impact of having a healthier population and a reduction on secondary and tertiary care costs because of providing more effective and early treatment. The sharing system brings the following benefits –

- (a) For **clinicians**, eHR will improve availability and transparency of information shared between healthcare providers in both the public and private sectors. Healthcare providers will be able to assess the right information at the right time. This will allow healthcare providers to improve the efficiency of their healthcare interventions and reduce the number of consultations that is necessary in order to achieve the desired outcome. Associated efficiency gains will be realised in avoiding the need to store, collage and transfer paper records. Record transportation costs will also be avoided.

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- (b) For **patients**, eHR will enhance the quality of care provided to patients by enabling better access by healthcare providers to acquire health information. The healthcare quality benefits will be delivered specifically by –
- (i) reducing the frequency and scale of medication errors;
 - (ii) providing more efficient and a more effective use of diagnostic tests;
 - (iii) increasing the speed of treatment, for example by eliminating repeated tests or information requests from a patient; and
 - (iv) improving the accuracy of diagnosis and patient management through clinical decision support.
- (c) For the **healthcare system** as a whole, the sharing system minimises duplicate investigations and errors associated with paper records, achieves more efficient and better quality healthcare and enables disease surveillance and health statistics for public health and policy making.

Cost Savings and Benefit

23. Upon the full implementation of the eHR sharing system, it is estimated that the above intangible benefits will bring about a nominal efficiency gain of up to \$862 million per annum to health expenditure in the following areas –

- (a) **Reduction in length of stay of patients:** Patient flow through in-patient setting is subject to a multitude of delays, for example, delays in the ordering process and in coordinating all of the information and communications necessary for discharge planning. The eHR sharing system helps reduce the length of hospital stays as a result of faster access to better quality information. It is estimated that up to \$287 million per annum of nominal efficiency gain could be achieved.
- (b) **Reduction in unplanned re-admissions:** Availability of health information through eHR may assist to provide information that will improve diagnosis and treatment, which will also in turn reduce unplanned readmissions. It is estimated that up to \$17 million per annum of nominal efficiency gain could be achieved.

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- (c) **Reduction in medication/prescription errors:** The availability of the eHR will allow doctors to have access to the drugs currently prescribed for the patients, and hence help reduce the number of medication/prescription errors regarding prescribing more expensive drugs to patients, or giving unneeded or contraindicated medication to patients. It is estimated that up to \$253 million per annum of nominal efficiency gain could be achieved.
- (d) **Reduction or elimination of administration for paper medical records:** Reduce or eliminate the need to administer and maintain paper patient records, and hence reallocate resources previously used in administering and maintaining paper patient records for delivery activities. It is estimated that up to \$93 million per annum of nominal efficiency gain could be achieved from eliminating the need of retrieving and making copies of paper medical records, and in staff costs from reduction in medical records and administrative personnel.
- (e) **Reduction in duplicated laboratory and radiology tests:** Reduce the number of redundant laboratory and radiology tests by allowing multiple providers to share the patient records. It is estimated that up to \$86 million per annum of nominal efficiency gain could be achieved.
- (f) **Reduction in documentation time spent by nurses:** eHR allows nurses to reduce time spent on documentation, redundant data collection and patient assessment. It is estimated that up to \$55 million per annum of nominal efficiency gain could be achieved.
- (g) **Reduction in documentation time spent by doctors:** eHR also reduces doctors' time in documentation, when referred patients attend out-patient clinics at hospitals, and when patients in private primary care are referred to specialist care in group practices or private hospitals. It is estimated that up to \$71 million per annum of nominal efficiency gain could be achieved.

FINANCIAL IMPLICATIONS

Non-recurrent expenditure

24. We estimate that the first stage of the eHR Development Programme from 2009-10 to 2013-14 will require a total non-recurrent expenditure of \$702 million. The pace, scope and funding to be required in respect of further development into the next stage will depend on various factors including, inter alia, the progress with the first stage, participation rate and needs of both healthcare

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providers and individuals as well as evolving features in IT. As a ballpark reference, the full development of the eHR sharing system for the 10-year planning horizon from 2009-10 to 2018-19 may require a total non-recurrent expenditure of \$1,124 million. The above estimates of non-recurrent expenditure have been validated by the consultants for the PMP as reasonable in connection with and for the implementation of the eHR Development Programme. We will ascertain the further capital funding to be required and seek funding approval after the first stage has progressed up to a more mature stage.

25. Breakdown of the non-recurrent expenditure estimate for the first stage of the development programme by the eHR components as set out in paragraph 8 above is in the table below.

eHR Components	2009-10	2010-11	2011-12	2012-13	2013-14	Total
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
(a) eHR sharing infrastructure core component	33,985	101,538	112,327	113,146	103,617	464,613
(b) CMS adaptation and extension component	11,358	35,080	41,612	39,613	40,697	168,360
(c) Standardisation and interfacing component	4,657	14,382	17,061	16,241	16,686	69,027
Total	50,000	151,000	171,000	169,000	161,000	702,000

Details on the ambit and estimated funding requirements of these components are set out at Enclosure 1.

26. Details of the first stage cost estimates by key expenditure items are as follows –

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	2009-10 \$'000	2010-11 \$'000	2011-12 \$'000	2012-13 \$'000	2013-14 \$'000	Total \$'000
(a) Computer hardware	6,821	10,658	11,427	9,470	10,077	48,453
(b) Computer software	5,461	6,587	8,600	7,390	8,640	36,678
(c) Costs for project development team	14,696	50,307	64,230	64,656	63,257	257,146
(d) Service implementation	16,882	54,023	56,749	51,940	51,654	231,248
(e) Communication line and equipment	1,000	2,000	7,000	5,000	4,000	19,000
(f) Data centre service	450	8,562	450	8,563	0	18,025
(g) Training	1,107	5,100	5,700	4,995	5,600	22,502
(h) Administrative and office costs	3,575	13,681	16,795	16,953	17,769	68,773
(i) Miscellaneous	8	82	49	33	3	175
Total	50,000	151,000	171,000	169,000	161,000	702,000

27. As regards paragraph 26(a), the estimate of \$48,453,000 is for the procurement of computer hardware and equipment, including computer servers, storage, workstations, end-user tools and other information processing equipment.

28. As regards paragraph 26(b), the estimate of \$36,678,000 is for the procurement of computer software, including operating system software, database licence, application development software and end-user software.

29. As regards paragraph 26(c), the estimate of \$257,146,000 is the staff costs of the dedicated eHR teams in HA for the development and implementation of the eHR system including the eHR sharing infrastructure core component, CMS adaptation and extension component and the establishment of various standards for clinical data and IT system interfaces. These eHR teams include health informatics

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staff, IT staff, project management and core administrative staff. The size of the eHR teams is estimated based on the anticipated scope of individual sub-projects, the experience of HAITS in developing its own clinical systems and implementation, and the comparison with similar overseas experiences in developing clinical systems.

30. As regards paragraph 26(d), the estimate of \$231,248,000 is for the procurement of agency contract staff services, professional and consultancy services to complement the eHR teams for the eHR system development, implementation and quality assurance in respect of data security and privacy design, standards development and health informatics consultancy from vendors. The scope of services required is estimated based on the anticipated scope of individual sub-projects, the experience of HAITS in developing its own clinical systems and implementation, and the comparison with similar overseas experiences in developing clinical systems.

31. As regards paragraph 26(e), the estimate of \$19,000,000 is for the procurement of network equipment and installation of communication lines.

32. As regards paragraph 26(f), the estimate of \$18,025,000 is for the setup costs for the data centres, including both primary and secondary data centres.

33. As regards paragraph 26(g), the estimate of \$22,502,000 is for providing training to doctors, nurses and other healthcare professionals, IT vendors/staff from private healthcare sectors and HA staff. The training covers the standards, data security and privacy and other technical areas.

34. As regards paragraph 26(h), the estimate of \$68,773,000 is for providing accommodation to project development teams, administration staff, and dedicated training and testing sites.

35. As regards paragraph 26(i), the estimate of \$175,000 represents the costs of miscellaneous items such as start-up consumable, e.g. backup tapes.

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Recurrent expenditure

36. To co-ordinate the complex and multi-faceted development programme of the eHR sharing system and to accomplish the various tasks required of the eHR programme as set out above, it is our plan to set up a dedicated eHealth Record Office (eHR Office) with a civil service set-up under the Health Branch of FHB and with support from a dedicated teams in HAITS. This is to allow the eHR Office to remain part of FHB to provide the necessary policy steer and co-ordination for the eHR programme, and at the same time tap the expertise and experience of developing clinical IT systems in HAITS in implementing the eHR sharing infrastructure and facilitating eHR development in the private sector. This setup will also be responsible for the eventual operation, maintenance and further development of the eHR sharing system.

37. The proposed eHR Office comprises three units, namely (a) Policy and Planning Unit, (b) Infrastructure and Development Unit and (c) Finance and Project Management Unit. The civil service setup in the eHR Office is planned to start off with 19 civil servants, headed by three directorate staff⁴, including the Head (D3), Deputy Head (D2) and a Chief System Manager (D1) (the first two posts to be created on a supernumerary basis for four years subject to review), and supported by 16 non-directorate staff including administrative officers, executive officers, system managers and other supporting staff. The dedicated support teams in HAITS will be established for individual functions and projects, and are expected to require up to 200 staff, mainly IT professional and supporting staff, when the development of the eHR system is at full steam.

38. We estimate that the annual recurrent expenditure arising from the project will be \$32.245 million in 2009-10 and will progressively increase to \$99.598 million in 2011-12, broken down as follows –

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4 The proposal to create the three directorate posts is set out in another submission endorsed by the Establishment Sub-committee and recommended for approval of the Finance Committee of the Legislative Council.

		2009-10	2010-11	2011-12
		\$'000	\$'000	\$'000
(a)	Professional support services of eHR sharing system	6,524	26,325	48,255
(b)	Hardware maintenance	0	1,362	4,447
(c)	Software maintenance	0	1,606	5,152
(d)	Administrative and office costs	15,346	17,232	20,067
(e)	Information system hosting service	0	7,844	7,844
(f)	Staffing of eHR Office	10,375	13,833	13,833
	Total	32,245	68,202	99,598

For the years beyond 2011-12, the annual recurrent expenditure arising from the project is expected to increase in accordance with the implementation progress of the eHR sharing system, the operational scale of the individual components, as well as the participation rate of both healthcare providers and individuals. It will be difficult to give a precise cashflow projection of the recurrent requirements for the longer term as this will depend on a host of factors including, inter alia, the pace of project development, review of support to be required over time and other prevailing circumstances. As a ballpark reference, and assuming full system coverage of all doctors and patients in the community over a ten-year planning horizon, implementation of the system may eventually involve recurrent expenditure of around \$200 million.

39. On paragraph 38(a) above, the annual expenditure of \$48,255,000 is for the project support staff costs in HAITS for the on-going maintenance and support of the eHR systems, including health informatics staff, IT staff, project management and core administrative staff and agency contract staff.

40. On paragraph 38(b) above, the annual expenditure of \$4,447,000 is for payment of maintenance for hardware equipments procured during the development and implementation of the eHR systems.

41. On paragraph 38(c) above, the annual expenditure of \$5,152,000 is for the payment of maintenance for software products procured during the development and implementation of the eHR systems.

42. On paragraph 38(d) above, the annual expenditure of \$20,067,000 is for providing accommodation and the day-to-day administrative expenses to the project support teams and the eHR Office.

43. On paragraph 38(e) above, the annual expenditure of \$7,844,000 is for providing hosting services for the primary and secondary data centres which will host the core eHR project computer, security and network equipments.

44. On paragraph 39(f) above, the annual expenditure of \$13,833,000 represents the staff cost for planning, developing, implementing and managing the eHR sharing system, handling the various policy and legal issues, engaging the various stakeholders in the private sector and the general public, and provision of on-going staff effort for sustaining the development of the eHR.

Revenue implications

45. To encourage the participation of the private and non-government sectors in the proposed eHR sharing platform, we intend to make available existing systems and know-how in the public sector, and relevant licences for adapting components in the public sector, at minimal or no cost. The revenue to be generated, if any, is expected to be nominal.

IMPLEMENTATION PLAN

Development Roadmap and Target

46. Under the roadmap, we have set an initial target to have the eHR sharing platform ready by 2013-14 for connection with all public and private hospitals, and to have eMR/ePR and other health information systems available in the market for private doctors, clinics and other health service providers to connect to the eHR sharing platform. The proposed implementation plan of the first stage of the eHR Development Programme (from 2009-10 to 2013-14) is as follows –

Project	Target Commencement Date	Target Completion Date
(a) eHR person master index development	The third quarter of 2009	The fourth quarter of 2011
(b) eHR architecture and design	The third quarter of 2009	The second quarter of 2011
(c) Pilot and partnership projects for eHR	The third quarter of 2009	The fourth quarter of 2013
(d) eHR system implementation and rollout	The first quarter of 2011	The fourth quarter of 2013
(e) CMS on ramp pilot development ⁵	The third quarter of 2010	The second quarter of 2011
(f) CMS on ramp development and implementation ⁶	The third quarter of 2011	The fourth quarter of 2013
(g) CMS adaptation basic modules ⁷	The first quarter of 2010	The fourth quarter of 2013

Encl. 3 A summary of the project deliverables of the first stage of the eHR Development Programme is set out at Enclosure 3.

PUBLIC CONSULTATION

47. We consulted the public on, inter alia, the proposal to develop eHR sharing through the publication of the Healthcare Reform Consultation Document “Your Health, Your Life” in March 2008. The proposal received overwhelming support during the first stage consultation on Healthcare Reform conducted between March and June 2008. Many of the views received urged the Government to expedite the implementation of the service reform proposals including that for eHR sharing.

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5 Pilot a CMS on-ramp to support private doctors and clinics access the full range of eHR functions.

6 Develop the full-release version of CMS on-ramp and to support the roll-out to users according to the experience gained in the CMS on-ramp pilot.

7 Adapt the CMS of HA for use in the private sector.

48. We consulted the Legislative Council Panel on Health Services on the proposed eHR Development Programme on 9 March 2009. Members supported in principle eHR sharing system, and requested further information on the estimated costs for the first stage of the Development Programme, the legal framework for safeguarding the data privacy and security of the eHR sharing system and the participation of private healthcare providers in the eHR sharing system (the requested information was provided to the Panel on Health Services on 12 May 2009). A number of organisations from the healthcare professions and IT sector have expressed their support to eHR development to the Panel in writing.

49. A special meeting of the Panel on Health Services was convened on 19 June 2009 to receive the views of deputations from the public and various sectors including the healthcare professions, private hospitals and clinics, patient groups, non-government organisations and the IT sector. Deputations attending the meeting were all in support of development of the eHR sharing system, and some raised specific issues such as personal data privacy, system security, legal safeguards and private participation that they considered should be addressed in the implementation of the eHR Development Programme. Further supplementary information on the strategy for private sector participation was provided to the Panel on 30 June 2009 as requested.

BACKGROUND

50. The Chief Executive (CE) has stated in the 2007-08 Policy Address and 2008-09 Policy Agenda that a territory-wide eHR will be developed to support healthcare reform and to provide essential infrastructure for the healthcare system. This will be achieved by providing healthcare providers with access to lifelong health records of individual patients for holistic care and facilitating referral and follow-up of cases between different levels of care through the eHR system. It is recognised that achieving the long-term vision of territory-wide eHR sharing requires leadership and co-ordination by the Government and collaboration with both the public and private healthcare sectors as well as other stakeholders.

Technical Scope of the eHR Sharing Platform

Introduction

The eHR development programme aims to create and maintain a territory-wide, patient-oriented electronic health record for each and every citizen in the population capturing essential health data that can be readily accessed by healthcare providers for healthcare-related purposes subject to the concerned individual's consent. Apart from personal particulars, such data include individuals' health-related information (e.g. weight, height, blood type, smoking status, etc.) as well as medical records kept by different healthcare providers (e.g. diagnosis, prescriptions, test results and discharge summary).

The eHR Sharing Platform

2. The sharing of such data among different healthcare providers in both the public and private sectors through a readily accessible eHR platform requires infrastructure and applications that are opened to all stakeholders. The technical scope of the eHR group of core systems involves –

- (a) standardisation of eHR and protocol for data sharing, both from the business perspective as well as the provision of a technical platform to support validation and certification;
- (b) development of a secured, robust and extensible application framework to allow for future expansion and upgrading on an on-going basis through a building block approach;
- (c) development, operation and maintenance of a substantial sharing infrastructure architecture for the inter-connection and interfaces of individual eMR/ePR systems from both the public and private sectors;
- (d) development of a secured technical platform to support the workflow for patient consent, dispute resolution and patient authentication that can safeguard individuals' rights and privacy;
- (e) provide a secured and well-audited technical platform to enable sharing of individuals' health records among healthcare providers (e.g. doctors, allied health professionals, pharmacists, laboratories) in both the public and private sectors while protecting the confidentiality of patients' data;

/(f)

- (f) facilitate the use of IT in the private healthcare sectors, including private hospitals, solo practitioners, laboratories, etc, through the provision of clinical management systems where required to enable the sharing of patients' health records ;
- (g) develop and provide a secured doctors' portal platform to enhance the doctors' workflow in health care;
- (h) develop and provide a secured patients' portal to enable co-production of the patient's health records; and
- (i) development of tools to enable the usage of the collected data for anonymous clinical and analytical use to improve healthcare through evidence-based medicine, disease management plan and healthcare planning.

The Three Components in eHR Development

3. As set out in paragraph 8 of the main paper, there will be altogether three major components in the development of the eHR in Hong Kong:

- (a) The eHR sharing infrastructure core component;
- (b) The CMS adaptation and extension component; and
- (c) The standardisation and interfacing component

The details are set out in the following sections.

(I) eHR Sharing Infrastructure Core Component (Phase I Development: \$464,613,000 in total)

4. An eHR should allow healthcare professionals in both the public and private sectors to enter, store and retrieve patients' medical records. To enable such sharing, the core infrastructure must be standards-based, robust and secured and be developed on a building-block basis to be sustainable and extensible. The scope of the core components of the eHR Sharing Infrastructure is broadly covered in the following areas –

/(a)

- (a) Project Management Office (PMO), which comprises the following functions –
 - (i) Project management;
 - (ii) Administrative support;
 - (iii) User requirement definition;
 - (iv) Health informatics design;
 - (v) Quality assurance and training activities; and
 - (vi) Partnership programmes;
- (b) Application Framework, which composes of –
 - (i) Framework;
 - (ii) Repository and data services;
 - (iii) Information Architecture, Certification and Standards Support;
 - (iv) Security and Audit; and
 - (v) Information services;
- (c) IT Infrastructure and Hosting Service; and
- (d) Public-Private Interface Pilot Projects.

(a) Project Management Office (Phase I Development: \$101,590,000)

5. To co-ordinate the complex development activities and wide range of personnel involved, a PMO composing of both healthcare professionals and administrative staff has to be established in HAITS to provide both system development and administrative support. The responsibilities and duties of the PMO include –

(i) Project Management

6. The PMO is responsible for the planning, control and project administration activities, such as the preparation and maintenance of planning and budgetary information; measuring progress and variances; and administration of control processes such as risk management and change controls.

/(ii)

(ii) Administrative Support

7. The PMO will also provide administrative support to the system development teams including the preparation of progress reports; support for procurement and contract management activities and execution of administrative and financial duties.

(iii) User Requirement Definition

8. The health informatics team within the PMO will communicate with the medical professionals to acquire requirements for the development and implementation of the health information systems under the eHR programme. The team will act as a bridge between the medical professionals and the IT staff to ensure that modules developed or acquired will meet the needs of the medical professionals in the community of Hong Kong.

(iv) Health Informatics Design

9. The health informatics team exercises design authority in the medical domain and covers design issues related to patient safety and treatment, medical processes and procedures, medical information, hospital and clinic management and administration.

(v) Quality Assurance and Training Activities

10. The PMO will co-ordinate quality assurance and training activities. The Office will involve medical professionals in focus groups and train the trainer programmes to validate requirements, evaluate prototypes, testing and pilots of the eHR deliverables.

(vi) Partnership Programmes

11. The PMO will co-ordinate and identify partnership pilot programmes through the eHR Engagement Initiatives (EEI) exercise. The proposals received from the EEI exercise will be assessed in accordance with the guiding principles, objectives and programme development plan for eHR development. The basic principle is that the partnerships must contribute towards building a territory-wide eHR infrastructure, promote interoperability of various systems and encourage eHR sharing. Close collaboration between the HAITS eHR teams and the private healthcare and IT sectors is essential to ensure success of these partnership programmes. These partnership programmes may occur at all levels of the eHR project including the sharing infrastructure, CMS adaptation and interface development.

(b) Application Framework (Phase I Development: \$242,297,000)

(i) Framework

12. The Framework forms the core application infrastructure to support the inter-operability of the suite of eHR systems. It determines the framework and architectural design of the eHR project and provides the shared services required for the development of the eHR modules. The technical platform, tools sets, system and services interfaces must be defined to allow development of the eHR modules by either the eHR IT teams or IT vendors. Technical infrastructure and software tools to support the development of such modules including two-factor authentication, patient registration, messaging and alert, communication services, workflow, platform for the doctors and patients portal and other common services will need to be established and provided for use. IT service sector is encouraged to participate in the development of novel technical solutions to meet the challenges of inter-operability.

13. The shared framework will allow various building blocks be developed in parallel. These building blocks will share the same architectural platform and communication channels, allowing different eMR/ePR systems to access and update the eHR. This building blocks approach allows collaborative development of the eHR modules by both the HAITs eHR teams and IT vendors through partnership programmes. Once these building blocks are ready, the doctors' portal and the patients' portal can be developed on this framework, facilitating healthcare workers in the continuing care of patients and enabling patients to participate more actively in their own health care by allowing them to review and update their own medical records.

14. The eHR Person Master Index (PMI) will also form part of the core structure of the eHR systems. A common PMI among different eMR systems is a pre-requisite for sharing and ensuring the accuracy of a patient's medical information. The eHR PMI will be developed and implemented for storage and maintenance of basic identity information of the patients. Secured shared services will be developed to allow registration and validation of the patient's identity via certified eHR applications implemented in the private healthcare sectors. Extensive discussion and partnership between the eHR teams and the private sectors are required to ensure a common standard is adopted for an accurate and sharable PMI.

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(ii) Repository and Data Services

15. The Repository, together with the eHR PMI, will form the core structure of the eHR where the storage and sharing of patients' health data will take place. The Repository will compose of the ePR and the Data Warehouse (DW). The purpose of the ePR is to support direct patient care while the DW will provide anonymous data for statistical and analytical purposes.

16. HA has been building its ePR and DW since 2000 and the paired repositories have proved to be successful in supporting both the operational and informational needs. Past experience has proved the need to segregate the operational and informational data stores and the need to re-format data for the respective purposes. Hence, although data from all participating stakeholders of eHR will be in a standardised message format, transformation will still be required to ensure the scalability, performance and sustainability in the storage and usage of the territory-wide medical data store.

17. The data stored in the repository can be retrieved and updated via generic data services. The data will be presented in a structure conforming to the information architecture and standards, thus providing user with data in a readable and meaningful form.

(iii) Information Architecture, Certification and Standards Support

18. To enable the sharing of medical data among healthcare providers, information model to give meaning and readability to the medical facts from various systems, standards for data interfacing and guidelines for system interoperability specifications have to be defined and implemented. Software support for the definition, collaboration and maintenance of these standards and guidelines has to be built to ensure their long term sustainability.

19. Once the standards are defined, technical platform and gateways will need to be provided to support the certification of standards compliance of all interfaces with the eHR. Certification will need to be covered in three main areas: data interface content and coding standards, system interoperability and compliance to the eHR security protocol. Once certified, both incoming and outgoing interfaces and transactions from these contributing parties will be received and transmitted through secured and guaranteed delivery gateways. The content of these interfaces will also be validated on an on-going basis to ensure that standards are complied with and the data will be transformed and stored in the repositories.

20. Training and technical support will be offered to facilitate the adoption of these information models and standards by private sectors. Certification programmes will be validated with private sectors through pilot interfaces and partnership programmes.

21. Registries will be maintained for the certified eHR contributing systems and interfaces as well as all eHR participating parties including public and private healthcare providers and consented patients. These will allow all parties, including both people and systems, be authenticated and their access controlled when interfacing with the eHR systems. A registry to support difference resolution to resolve differences in medical facts of the same patient from different healthcare providers will also be maintained.

(iv) Security and Audit

22. The privacy of the patients is of paramount importance. The eHR programme and security of the eHR suite of systems must therefore be well designed to ensure that the privacy of the patients and integrity of the systems are protected. The eHR will be designed from the ground up to be secure with special emphasis on authentication services for patients and healthcare providers, identity protection system with advance access control to protect against unauthorised access of patient's data, and encryption of sensitive and identity related data. Data for public health and statistical purposes will also be de-identified before access is allowed.

23. Extensive studies will be carried out to build the security infrastructure and control mechanism at all levels of the eHR system architecture to prevent breach of security and unauthorised access. Participation from the private sectors will be encouraged in the design and adoption of cutting edge security and control mechanisms.

24. Infrastructure to support security and audit will be built into the Application Framework to ensure that all eHR modules and systems are auditable. Regular audit reporting for different levels of control will be made available for review to ensure that security breach or abnormal data access patterns can be identified.

(v) Information Services

25. Information services will be made available to users at a later stage when the repository and clinical functions have been rolled-out. These services will provide value-added facilities such as management reporting, statistical reports and health information alerts.

26. Health statistics, disease surveillance, and medical research functions will also be supported by allowing prompt provision of anonymous data and compilation of health statistics through the DW of the eHR system.

27. The data can also be analysed and provide basis for evidence-based medicine. Rules and workflow engines may be utilised and integrated with the eHR and CMS to provide support for the development of modules such as Disease Management Modules for different diagnostic groups.

(c) *IT Infrastructure and Hosting Services (Phase I Development: \$71,672,000)*

28. The database servers and application servers of the eHR infrastructure will have to be hosted in a secure platform with multiple firewalls, intrusion detection systems and industry leading encryption technology to support different application services and to protect the patients' medical data. Extensive security infrastructure and monitoring tools will also be planned for and installed to support the application security design and audit functions.

29. Sufficient network bandwidth has to be provided to ensure efficient access and transfer of data across the secured network. Resilience also needs to be built into every layer of access including the network, application services and database so that there will be no single point of failure in the system to affect healthcare delivery. A highly-available seven days by 24 hours' system services level has to be planned for and established to support round the clock healthcare delivery services. The necessary monitoring consoles and software tools will be installed to provide on-going system monitoring to ensure smooth and reliable operations of the eHR systems.

(d) *Public-Private Interface (PPI) Pilot projects (\$49,054,000)*

30. The public-private interface electronic patient record (PPI-ePR) sharing pilot has been in use since mid 2006 and is the cornerstone of many of the sharing concepts. The pilot has evolved in expanding the sharing of HA's records to different healthcare settings as well as its scope of coverage. The pilot will continue before the actual eHR is put in place to gather views and feedback from private practitioners. The scope of development in the pilot schemes will aim to validate specific concepts or technology with a view to scaling up to become a key building block in the development of the eHR. These include the validation of key development such as role-based security control and access system, the use of various security means for patient authentication and consent, integration with different health care systems, the use of the eHR PMI and expanded two-way sharing to other community healthcare providers such as community laboratory, radiology and pharmacy services.

(II) CMS Adaptation and Extension Component (Phase I Development: \$168,360,000 in total)

31. A key strategy to eHR development is to leverage the existing systems and expertise of HA, which has over the past decade developed its own ePR/CMS with tremendous success. The goal of CMS Adaptation and CMS On-ramp development is to leverage on HA's CMS development experience to facilitate the adoption of ePR/eMR system in the private healthcare sectors, which currently varies significantly. Some private hospitals have already established their eMR systems while most solo private practitioners are still paper-based. Clinical data are usually kept as hardcopies, and those that are kept electronically often do not meet standards capable of sharing.

(a) CMS Adaptation (Phase I Development: \$96,157,000)

32. To enable sharing of clinical data in the eHR platform, the adoption of ePR/eMR systems with data sharing and integration capabilities by private hospitals is essential. The eHR team will carry out gap analyses on the eMR IT requirement and capabilities of the private hospitals. The team will make adaptation to the CMS so that workflow and clinical care requirements of private hospitals can be met. Licence to use the adapted CMS will be offered to private hospitals to facilitate their deployment of eMR systems with minimal investments. Integration with existing clinical systems will also be required to ensure a smooth clinical record browsing experience for the healthcare providers. Extensive consultation and close collaboration with clinical users and IT teams from the private sector will be essential to achieve such integration. Partnership programmes to enable such inter-operability and integration will be encouraged.

33. For private hospitals with established eMR systems, they may partner with the eHR team to upgrade their systems to comply with the eHR requirement on security protocol, system interoperability and data sharing/interface capabilities. Selective modules of the CMS will be adapted and deployed in these hospitals to fill in the functional gaps of their eMR systems. Technical advice and consultancy will be provided so that IT vendors or the private hospitals' IT teams will be able to enhance their systems to utilise the shared services provided by the eHR core platform including patient authentication, communication and alert services.

34. For private hospitals without established eMR systems, they may deploy the adapted CMS as their eMR system. Consultancy services and training will be provided to the private hospitals or IT vendors through the EEI partnership programmes to enable the implementation of CMS modules in these hospitals.

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(b) CMS On-ramp (Phase I Development: \$72,203,000)

35. To facilitate private practices to adopt eMR system with sharing capability, suitable clinic management software (CMS On-ramp) will be developed or sourced from the market as a turn-key system readily usable by private practitioners with minimal investment and maintenance. The CMS On-ramp will have sharing and integration capability and comply with the eHR security and system interoperability requirement.

36. For private group practices, the eHR team can provide technical advice and consultancy to IT vendors or their IT teams to enhance their eMR systems to comply with the eHR sharing requirement through partnership programmes. Support will be provided to facilitate certification and to ensure that these systems will be able to utilise the shared services offered by the eHR core infrastructure.

(III) Standardisation and Interfacing Component (Phase I Development: \$69,027,000 in total)

37. The Standardisation and Interfacing component aims to develop technical standards for different healthcare IT systems to enable data sharing and interoperability through the eHR sharing infrastructure. The governance structure on management of standards would be developed to ensure sustainability of the standards which will be well adopted by the healthcare sector. A team of health informaticians will collaborate with the healthcare community to develop these standards and guidelines to ensure acceptance and maintainability. Definition of standards not only ensures data integration among participating eHR healthcare applications but also enable an open platform for IT vendors to develop applications which can enrich the eHR environment.

38. The team will be required to develop and define data standards including medical terminology standards, coding standards and document standards and architecture. System interface and message standards also need to be developed and defined to ensure data integration among different applications. The team will also be responsible for the development and establishment of eHR related procedures and guidelines including patient authentication procedures, medical record handling procedures, dispute handling procedures, etc.

39. On top of the technical standards, an information architecture model also has to be defined and developed to delineate and give meaning to the medical facts of different systems. The Information Architecture Model ensures that all the medical facts can be stored, retrieved and presented in a meaningful and readable format to facilitate the workflow of healthcare providers. These definitions and information architecture must be developed via concerted effort of the healthcare community to ensure broadly understood concepts and meanings of these collected medical facts.

40. In the process of defining the eHR interface and inter-operability standards, technical platform and gateways will be built to support such interfaces and inter-operability through the eHR Application Framework. Partnership programmes will be identified for interface pilots with private healthcare providers through conducting the EEI. These interface pilots should cover different clinical settings such as radiology practices, laboratories and private practices so that standards applied in different clinical contexts can be validated. The pilot partnership programmes can also help to promote and strengthen healthcare interface development experience in the private sectors and to validate the eHR certification programmes.

41. Electronic connection to healthcare services such as group practices, laboratories and radiology services will also be enabled to facilitate the adoption of eMR/ePR solutions by these private practitioners and to provide a bridge between their systems and the eHR systems. For private practices which intend to use their own eMR/ePR systems, technical support to facilitate the certification of these systems will be offered through public-private partnership programmes to ensure inter-connectivity and inter-operability.

42. The interfacing project aims to engage private facilities to share diagnostics examination results in particular those of radiology and laboratory. In initial years, the project will focus on transferring images and reports of the patients referred by HA from selected radiological centres to HA's CMS and ePR. Upon the establishment of an eHR platform and relevant interface standards, the team will continue the partnership with other private diagnostics facilities to upload examination results of eHR enrolled patients to the central eHR repository. Through the EEI exercise, proposals will be invited from private sector and these proposals will be assessed according to the eHR development roadmap and partnership models.

Outline of eHR Engagement Initiative

Introduction

The engagement and participation of all stakeholders in the private and non-government sectors will be essential to building up a territory-wide patient-oriented eHR system. It will be vital to engage the many stakeholders in the healthcare sector at an early stage of eHR development to help ensure compatibility among the systems used in both the public and private sectors, and seamlessness in eHR sharing in the future. We also intend to engage the IT service sector to encourage their participation in the development of novel technical solutions to meet the challenges of inter-operability.

Objectives of eHR Engagement Initiative

2. The objectives of the EEI will be to –
 - (a) gain feedback from all healthcare sector stakeholders in what ways eHR can potentially assist their care of patients, ensure continuity of care and enhance safety and quality;
 - (b) provide an opportunity to promote and update on the development of eHR among all stakeholders;
 - (c) invite preliminary proposals for eHR partnership from potential partners in both healthcare and IT sectors;
 - (d) gain a more in-depth appreciation of current and future development plans for electronic medical/patient record (eMR/ePR) systems in the private and non-government sectors; and
 - (e) share ideas that can promote inter-operability of eMR/ePR systems and seamlessness in eHR sharing.

Private Stakeholders to be Engaged

3. We envisage that potential partners will range across many sectors, including:
 - (a) medical and other healthcare professional bodies;
 - (b) IT professional bodies;

/(c)

- (c) patient groups;
- (d) private healthcare providers;
- (e) private hospitals;
- (f) private clinics (in group or solo practices);
- (g) private laboratory and radiology services providers;
- (h) other allied health providers;
- (i) other healthcare providers (dentists, Chinese medicine practitioners, pharmacists/ pharmacies, etc.);
- (j) non-government organisations (elderly care homes, elderly centres, other social welfare non-government organisations, etc.); and
- (k) private IT vendors including those currently engaged in providing healthcare IT solutions.

Proposals for eHR Partnership

4. All stakeholders will be invited to submit proposals on possible partnerships for eHR development. Under such partnerships, the Government will provide capital funding only in respect of the components that fall within the eHR sharing infrastructure set out in the eHR development roadmap. The private sector partners (whether non-profit-making or otherwise) will remain responsible for their own hardware and software (except eHR systems, applications and platform offered by the Government for direct use, deployment, adaptation or customisation by private sector), and recurrent operating costs for their own eMR/ePR systems without direct subsidy from the Government. Such partnerships may include projects in the following models –

- (a) sponsoring specific non-profit-making projects contributing to the development of eHR sharing

Potential Partners: Professional organisations

<u>Contribution from the Government:</u>	<u>Contribution from Partners:</u>
<ul style="list-style-type: none">▪ Provide sponsorship for the project (partial or full).▪ Provide specific technical inputs as necessary.	<ul style="list-style-type: none">▪ Initiate proposals.▪ Provide expertise in designing and managing the project.▪ Share contribution if sponsorship not in full.

/Examples

Examples of Ongoing / Potential Initiatives:

- Open-source clinical management system for use by private doctors.
- Development of a pilot validation platform for testing interoperability of eMR/ePR systems of individual healthcare institutions.

- (b) providing development support to private healthcare providers in upgrading their information systems with sharing capabilities up to eHR standards

Potential Partners: Private hospitals, clinics and other healthcare providers (e.g. laboratories) which already have their own eMR/ePR or related information systems

<u>Contribution from the Government:</u>	<u>Contribution from Partners</u>
<ul style="list-style-type: none"> ▪ Make available existing systems and know-how in the public sector and eHR standards at minimal or no cost. ▪ Provide the capital development cost¹ for: <ul style="list-style-type: none"> i. equipping the eMR/ePR systems of the private healthcare providers with sharing capabilities; and ii. building the interfacing components between the eMR/ePR systems and the sharing infrastructure ▪ Provide development and other technical support and services as necessary. 	<ul style="list-style-type: none"> ▪ Pay for the hardware and implementation cost for upgrading their existing eMR/ePR systems. ▪ Shoulder the capital development cost for: <ul style="list-style-type: none"> i. additional functionalities specific to the private healthcare providers' eMR/ePR systems; and ii. extension of their eMR/ePR systems beyond the scope of the eHR adaptation and interfacing components. ▪ Shoulder the recurrent costs for operating and maintaining their eMR/ePR systems.

Examples of Ongoing / Potential Initiatives:

- Possible partnership with private hospitals, private practices and private laboratories with their own eMR/ePR system.

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¹ Cost-sharing arrangements subject to further discussion in respect of individual projects.

- (c) making available existing systems and know-how in the public sector through licensing to private healthcare providers for developing and deploying their own eMR/ePR systems

Potential Partners: Private hospitals, clinics and other healthcare providers (e.g. laboratories) which do not have their own eMR/ePR or related information systems and/or are interested in developing their own systems by adapting existing systems of the public sector

<u>Contribution from the Government:</u>	<u>Contribution from Partners</u>
<ul style="list-style-type: none"> ▪ Make available existing systems and know-how in the public sector and eHR standards at minimal or no cost. ▪ Provide the capital development cost² for: <ol style="list-style-type: none"> i. adapting and customising the systems available in the public sector for deployment by private healthcare providers; and ii. building the interfacing components between the eMR/ePR systems and the sharing infrastructure. ▪ Provide development and other technical support and services as necessary 	<ul style="list-style-type: none"> ▪ Pay for the hardware and implementation cost for deploying their own eMR/ePR systems. ▪ Shoulder the capital development cost for: <ol style="list-style-type: none"> i. additional functionalities specific to the private healthcare providers' eMR/ePR systems; and ii. extension of their eMR/ePR systems beyond the scope of the eHR adaptation and interfacing components. ▪ Shoulder the recurrent costs for operating and maintaining their eMR/ePR systems.

Examples of Ongoing / Potential Initiatives:

- Possible partnership with private hospitals without existing eMR/ePR systems.

- (d) developing generic eMR/ePR systems and related services for use by private healthcare providers by leveraging existing systems and know-how available in the public sectors

/Potential

² Cost-sharing arrangements subject to further discussion in respect of individual projects

Potential Partners: Solo practitioners or private clinics which do not have their own eMR/ePR system and are interested in using existing systems of the public sector

<u>Contribution from the Government:</u>	<u>Contribution from Partners:</u>
<ul style="list-style-type: none">▪ Pay for the development of the generic eMR/ePR systems by leveraging existing systems and know-how available in the public sector.▪ Make the generic eMR/ePR systems and other services available to private healthcare providers at minimal or no cost and facilitate their use by private healthcare providers through possible partnership with private IT vendors.	<ul style="list-style-type: none">▪ Pay for the hardware and installation cost for using the generic eMR/ePR systems.▪ Shoulder the recurrent costs for services (e.g. internet connection) necessary for using the eMR/ePR systems including any IT support services provided by the private IT vendor.

Examples of Ongoing / Potential Initiatives:

- The Government will adapt/customise the existing systems in the public sector i.e. HA's CMS (including phase III) for use by private healthcare providers.
- Further development of generic eMR/ePR systems and developing the systems through private vendors to be further explored.

- (e) licensing necessary technology to IT vendors for developing eMR/ePR systems with sharing capabilities in accordance with eHR standards and operating certification scheme for compliance and inter-operability

Potential Partners: IT vendors interested in developing eMR/ePR solutions for selling to private healthcare providers

/Contribution

<u>Contribution from the Government:</u>	<u>Contribution from Partners:</u>
<ul style="list-style-type: none">▪ License eHR standards or other eHR-related intellectual property in the public sector to vendors for the purpose of developing eHR systems for use by local healthcare providers.▪ Operate a certification scheme for the eHR systems developed by vendors to ensure interoperability between different components of the eHR sharing infrastructure.	<ul style="list-style-type: none">▪ IT vendors to shoulder the development costs for developing the eMR/ePR solutions, including cost for any licensing for public sector systems and standards, and for certification.▪ Private healthcare providers to pay for market price for adopting the eMR/ePR solutions provided by these vendors, including the hardware, implementation, operation and maintenance costs.

Examples of Ongoing / Potential Initiatives:

- Possible partnership with private IT vendors interested in developing eMR/ePR solutions to be further explored.

5. The proposals received from the EEI exercise will be assessed in accordance with the guiding principles, objectives and programme development plan for eHR development. The basic principle is that the partnerships must contribute towards building a territory-wide eHR infrastructure, promote interoperability of various systems and encourage eHR sharing. Apart from evaluating the proposals' priority in the context of their significance and value-added within the eHR Development Programme and the eHR sharing infrastructure, priority would be accorded to proposals with the following potential anticipated benefits –

- (a) Improving health outcome;
- (b) Facilitating clinical information flow;
- (c) Enhancing quality of service;
- (d) Enhancing risk management, e.g. drug utilisation;
- (e) Improving efficiency and effectiveness in the provision of health services; and
- (f) Other areas which would provide enhanced benefits to patients.

6. We will seek the inputs of the Working Group on eHR Partnership (WG-eHRP) under the Steering Committee on eHR Sharing on the criteria for assessing and prioritising such partnership proposals. With the received proposals, the WG-eHRP could further advise on the appropriate strategy to further promote eHR development and sharing in the private sector. WG-eHRP may also formulate other recommendations to promote eHR sharing among the general public and private stakeholders.

Launching of the EEI

7. The eHR Office to be set up is going to issue an EEI invitation document in the third quarter of 2009 to invite proposals from the private sector. This will be supplemented by an engagement programme which will include, in addition to media publicity, a series of briefings and focus group meetings to allow direct communication with the many targeted stakeholders with a view to sharing their ideas towards the building of the eHR system at an early stage.

Timeframe of the EEI

8. The proposed timeframe of the EEI is as follows –

Key Activities	3Q 09	4Q 09	1Q 10	2Q 10	3Q 10
EEI preparation					
Formulation of strategies					
Document preparation					
Launch of EEI					
Publicity and engagement activities (Briefings, focus group meetings etc)					
Interim review of EEI Submissions					
Report Submission					

Further Steps

9. The EEI will not end there. Rather we see engagement of the private sector an integral part of eHR development, which will be an interactive process that will continue between all stakeholders throughout the life of the project, guiding the planning, facilitating the roll-out of individual programmes and enhancing systems as they mature. The engagement process will continue even after the launch of the EEI and further invitation for proposals may be conducted as necessary. In short, the EEI will recognise and mobilise the major role that all private partners will play in this major challenging initiative.

**Summary of the Deliverables of the
First Stage of the eHR Development Programme (from 2009-10 to 2013-14)**

<u>I. eHR Sharing Infrastructure Core Component</u>	
<u>Project</u>	<u>Scope and deliverables</u>
Core architecture and infrastructure design	<ul style="list-style-type: none"> Specify the overall eHR architectural design for core components and systems.
Security and consent model	<ul style="list-style-type: none"> Consult the healthcare, information technology profession, stakeholders and the public on their needs for a secured platform for eHR sharing, the voluntary participation by both patients and healthcare providers, the authorisation and consent required for record access, user authentication and access control of the system, and system security and privacy protection measures. Explore, as based on the outcomes of the consultation with stakeholders and the public, the necessary long-term legal framework for safeguarding the privacy and security of personal health data with particular attention to the context of the eHR sharing system. Prepare for drafting of any necessary legislation having regard to existing applicable legislative provisions and the overseas legal experience. Define the model for privacy, security and patient consent that will be used as the basis for designing the first stage infrastructure.
eHR person master index (PMI)	<ul style="list-style-type: none"> Develop and implement the system to store and maintain the person master records for the overall eHR system. Define the PMI data structure. Establish the policies and procedures for managing and maintain the PMI. Roll-out the PMI and enroll patients. Initiate patient enrollment programmes through the publicity or public education programme under the eHR Engagement Initiative (EEI). Promote to and educate the public, under the EEI, the concept of eHR sharing through the use of PMI.

eHR validation platform	<ul style="list-style-type: none">• Provide a platform for testing and preliminary validation of eHR feasibility to test the technical feasibility of sharing patient data among different healthcare providers and to illustrate how the sharing of an eHR would work in practice.• Collaborate with private IT vendors by identifying partnership projects under EEI to develop a platform which would connect to the eHR infrastructure.
eHR content and standards management systems	<ul style="list-style-type: none">• Specify and design the technical standards for the data interfaces with eHR.• Implement information management systems to support standards maintenance and interface definition maintenance.• Communicate technical and data standards to private sector parties developing eHR connected systems and provide technical development support to private healthcare providers or IT service providers through the identified partnership programmes from EEI, e.g. licensing the eHR content and technical standards to private sectors for developing and deploying their individual eMR/ePR systems.
eHR security infrastructure	<ul style="list-style-type: none">• Design and implement the security infrastructure for the eHR system, including both the centrally provided infrastructure and applications and also private sector third-party systems that will connect.• Conduct, in collaboration with the Office of the Government Chief Information Officer, the Security Risk Assessment and Security Audit in respect of the whole eHR Programme and individual development designs and projects.

eHR security certification programme	<ul style="list-style-type: none">• Provide the eHR community with definitive standards for the security of any system connecting with the shared eHR infrastructure.• Implement systems to be used in certifying systems conformance to these standards.• Implement protocols for managing certification.• Communicate security certification processes to private sector developers and coordinate their certification and support private sector developers through certification under EEI.• License necessary technology to IT vendors for developing secured eMR/ePR systems with sharing capabilities under EEI in accordance with eHR standards and operating certification scheme for compliance and inter-operability.
Clinical data repository	<ul style="list-style-type: none">• To design and build the Clinical Data Repository and data warehouse to store centrally-held health records.
eReferral	<ul style="list-style-type: none">• Implement a system to support clinical referrals.• Enable referral by electronic means between the public and private sectors, e.g. provision of necessary patient records from the public sector to the referred physicians, centres or laboratories or other possible allied healthcare providers in the private sector.• Automate work flow of referral and acknowledgement and provide necessary information to the eHR.

/Doctors'

<p>Doctors' portal</p>	<ul style="list-style-type: none"> • Implement a web-based portal for private sector doctors to be able to access the eHR system to support their daily work. • Achieve a low investment cost access channel for doctors unable or unwilling to install the CMS on-ramp. • Necessarily, the functionality provided in doctors' portal will be less rich than will be provided through the CMS on-ramp channel. • Initiate doctors enrollment programme under the engagement, publicity and media campaigns of the EEI to promote enrollment of doctors to the portals. • Provide necessary training to healthcare providers under EEI or in collaboration with the Office of the Government Chief Information Officer to ensure adequate computer literacy which in turn will foster enrollment amongst them to the portal.
<p><u>eHR Pilot and Partnership Projects</u></p>	
<p>Public private interface electronic patient record sharing pilot (PPI-ePR)</p>	<ul style="list-style-type: none"> • Provide a read-only interface for private healthcare institutions and doctors to access HA patient records and validate the attitudes of doctors and patients to clinical and privacy aspects of eHR. • Support, administer, refine and expand the PPI pilots and increase the adoption and usage of the PPI pilot systems amongst the medical community.
<p>Radiological image sharing pilot</p>	<ul style="list-style-type: none"> • Pilot connection from private radiological imaging services to HA's ePR. • Transfer radiological images and reports from private radiological services to HA's ePR system.
<p>Laboratory results sharing pilot from private facilities</p>	<ul style="list-style-type: none"> • Connect private laboratories to the HA's ePR system and enable sharing of their lab results and reports with doctors.
<p>Other partnership projects for eHR foundation</p>	<ul style="list-style-type: none"> • Other partnership projects to be identified through the EEI contributing to building the foundation for the eHR sharing platform including facilitating the development of eMR/ePR systems with sharing capabilities in the private sector.

<u>II. CMS Adaptation and Extension Component</u>	
<u>Project</u>	<u>Scope and deliverables</u>
CMS adaptation (basic modules)	<ul style="list-style-type: none"> Adapt the basic modules of HA's clinical management system for use in the private sector. To facilitate the adoption of the CMS by private hospitals under EEI for sharing with the eHR.
Private hospital clinical data repository	<ul style="list-style-type: none"> Work with private hospitals under EEI to implement eHR access from their own clinical management systems. Establish a reference model for private hospital CMS data repositories. Specify how private hospitals can share data with eHR.
CMS on-ramp	<ul style="list-style-type: none"> Develop a prototype of the CMS on-ramp system. Pilot the CMS on-ramp to support private doctors and clinics and gain experience to be incorporated into the full CMS on-ramp system. Functions that will be included in the on-ramp pilot are patient registration, attendance, booking, basic billing, medication order entry and clinical documentation. Develop the full-release version of CMS on-ramp and to support the roll-out to users. Functions to be provided in CMS on-ramp will be determined upon the results of the CMS on-ramp pilot.
Other partnership for adaptation and extension	<ul style="list-style-type: none"> Other partnership projects to be identified through the EEI contributing to leveraging the existing HA CMS systems and technologies for development and implementation in the private sector.
<u>III. The Standardisation and Interfacing Component</u>	
<u>Project</u>	<u>Scope and deliverables</u>
eHR record standard definition (first stage)	<ul style="list-style-type: none"> Define the structure and coding of the eHR record to the degree of detail needed to support all eHR projects in first stage.

eHR data standards	<ul style="list-style-type: none"> • Establish, maintain and develop the data standards and structure for the content of the eHR record, including the data elements, structure, coding and nomenclature. • Make available the eHR standards in the public sector through licensing to private healthcare providers for developing their own eMR/ePR systems, making use of identified partnership projects under EEI.
eHR interoperability standards	<ul style="list-style-type: none"> • Develop and refine an initial set of interoperability development standards. Develop interoperability technical standards. Specify and subsequently administer an interoperability standards management system. • License necessary interoperability standards under partnership projects in EEI to IT vendors for developing eMR/ePR systems with sharing capabilities in accordance with eHR standards.
Standards management	<ul style="list-style-type: none"> • Develop a standards management lifecycle to ensure proper management of the standards created across the programme.
Systems registry	<ul style="list-style-type: none"> • Develop a certification scheme for different levels of eHR operability. • Set up the office for system registry and support the development of a system registry system. • Operate certification scheme for compliance and inter-operability under identified partnership projects under EEI.
Terminology management	<ul style="list-style-type: none"> • Establish a common, shared terminology for the eHR system. • Standardise all medical/clinical nomenclature and terminology across eHR and/or define terminology conversion to map one terminology against another. • Define and develop a terminology management system to support the initial alignment of terminology and the ongoing maintenance of the terminology standards.

eHR interfaces certification programme	<ul style="list-style-type: none">• Provide the eHR community with definitive standards on how to interface to exchange data with the eHR systems.• Implement systems to be used in certifying systems conformance to these standards.• Implement protocols for managing certification.• Communicate eHR certification processes and standards to private sector developers under EEI and support them in certifying their systems for use with eHR.• Support DH eHR projects in interfacing with the eHR system.
Establish eHR operations	<ul style="list-style-type: none">• Establish the base operations and staffing for the ongoing eHR system.• Establish the departmental or corporate structure of an eHR operating entity.• Create service contracts with IT and other service providers to support ongoing operations.• Define and implementing service level performance targets.• Define how and when the operational organisation comes into existence and how daily operations transition from the programme to the eHR operating entity.
Other partnership for standardisation and interfacing	<ul style="list-style-type: none">• Other partnership projects to be identified through the EEI contributing to standardisation for eHR sharing purposes including their adoption by eMR/ePR systems, as well as interfacing with eMR/ePR system in the private sector.
