CHAPTER 10

PUBLIC BODY

Hospital Authority

Management of medical equipment

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MANAGEMENT OF MEDICAL EQUIPMENT

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MANAGEMENT OF MEDICAL EQUIPMENT

Summary and key findings

A. **Introduction.** The Hospital Authority (HA) is a statutory body established in 1990. It is responsible for managing 44 public hospitals/institutions which provide about 29,000 hospital beds. There are about 75,000 items of medical equipment in the HA hospitals costing $5.1 billion. In 2000-01, the Government granted $28,353 million recurrent subvention to the HA. In the same year, the HA spent $540 million on new medical equipment, and $324 million on maintenance of medical equipment (paras. 1.1 to 1.16).

B. **Acquisition of furniture and equipment for new hospital projects.** For two recently-built hospitals, namely the North District Hospital (NDH) and Tseung Kwan O Hospital (TKOH), the Finance Committee (FC) of the Legislative Council approved $290 million and $292 million (at constant prices) respectively for the acquisition of furniture and equipment (F&E). In addition, the FC also approved $138 million for the NDH and $197 million for the TKOH for estimated inflation provisions for F&E. Project lump sums, based on money-of-the-day prices of the approved project estimates ($1,690 million for the NDH and $2,047 million for the TKOH), were paid to the HA at the beginning of the projects in the mid-nineties. Within these project lump sums, the money-of-the-day F&E cost for the NDH was $443 million (including $15 million transferred from project contingencies), and for the TKOH was $489 million. Up to 31 July 2001, the Health and Welfare Bureau had given approval to the HA to use most of the F&E provisions (including the inflation provisions) for the two projects. Audit noted that the actual outturn inflation rates for F&E for the two projects were considerably lower than the forecast inflation rates stated in the FC papers for the projects. Up to the end of July 2001, the F&E expenditure committed by the HA for the NDH was $300 million, and that for the TKOH was $276 million. These two hospitals have been in operation for a few years. However, there was no clear mechanism for properly monitoring the use of inflation allowance for F&E costs for the two projects (paras. 2.5 to 2.40).

C. **Scale of provision for commonly-used medical equipment.** Since 1998, the HA has launched a pilot scheme on scale of provision for eleven types of commonly-used medical equipment in hospitals. Based on the approved scale of provision, Audit noted that there were significant shortfalls in some types, and surpluses in other types, of medical equipment in four randomly selected hospitals (paras. 3.2 to 3.10).

D. **Procurement of medical equipment by HA hospitals.** Audit noted that most HA hospitals conducted procurement of medical equipment individually without central coordination. This has led to higher administration costs, higher procurement costs and proliferation of brands of equipment (paras. 4.5 to 4.11).

E. **Utilisation of medical equipment.** Audit noted that the utilisation of some major medical equipment items in some hospitals was low when compared with the expected utilisation. In a sample of 50 items of major medical equipment in established hospitals, the utilisation of eleven items was lower than the expected utilisation by more than 50%. In another sample of 20 items of major medical equipment in new hospitals, the same level of underutilisation was also found in seven items (paras. 5.7 to 5.18).

F. **Maintenance cost variations among hospitals.** Audit noted that there were significant variations in the maintenance costs of medical equipment among acute hospitals. For example, the percentage of maintenance cost of X-ray equipment (as a percentage of equipment cost) for the Yan Chai Hospital was 12% whereas for the Pamela Youde Nethersole Eastern Hospital it was only 4.2%. Regarding non X-ray equipment, the percentages for the NDH and the Kwong Wah Hospital were 8% and 4% respectively (paras. 6.7 to 6.9).

G. **Different service providers and maintenance approaches between Schedule 1 and Schedule 2 hospitals.** Audit noted that, for historical reasons, Schedule 1 hospitals normally used the services provided by their in-house personnel or the Electrical and Mechanical Services Trading Fund (EMSTF) for maintenance of medical equipment, whereas Schedule 2 hospitals mainly used the services of outside contractors. Audit also noted that most Schedule 1 hospitals adopted preventive maintenance for medical equipment, while most Schedule 2 hospitals adopted corrective maintenance. Preventive maintenance is usually more costly than corrective maintenance. Furthermore, Schedule 2 hospitals normally selected their contractors to provide maintenance services themselves without the central coordination of the HA Head Office (paras. 6.10 to 6.19).

H. **HA's overall management of medical equipment.** Audit notes that the HA lacks a coherent strategy for the management of medical equipment (paras. 7.2 and 7.3).

I. **Audit recommendations.** Audit has made the following major recommendations that the Secretary for the Treasury, in collaboration with the Secretary for Health and Welfare, should:

(a) before the commencement of future hospital projects, agree with the HA a mechanism for establishing the F&E requirements and for monitoring the acquisition of F&E items (para. 2.37(a)); and

(b) in future FC papers for hospital projects, state the basis of provision of F&E expenditure (e.g. indicating the F&E expenditure expressed as a percentage of the estimated construction cost of the hospital based on previous hospital projects, or alternatively providing a list of major F&E items — para. 2.37(b)).

J. Audit has also made the following major recommendations that the Chief Executive, HA should:

(a) make improvements to the standards and criteria for the provision of commonly-used medical equipment in hospitals (para. 3.9(b));

(b) consider forming a central procurement unit in the HA Head Office to consolidate the resources and procurement expertise in hospitals (para. 4.16(b));

(c) implement procedures to enable the HA Head Office to monitor and improve the utilisation of major medical equipment installed in hospitals (para. 5.17(b));

(d) for new hospitals, improve the medical equipment acquisition programme so that the acquisition of major medical equipment items dovetails with the build-up of demand for medical services (para. 5.17(c));

(e) conduct a review to ascertain the reasons for the variations in maintenance costs of medical equipment among hospitals with a view to adopting more cost-effective arrangements for all HA hospitals (para. 6.40(a));

(f) establish a centralised unit in the HA Head Office or in each cluster of hospitals to coordinate the granting and monitoring of maintenance contracts for X-ray and non X-ray equipment for all HA hospitals (para. 6.40(b));

(g) based on the results of risk assessments, adopt a consistent set of preventive maintenance procedures for all high-risk equipment items, and a consistent set of corrective maintenance procedures for medium-risk or low-risk items in all HA hospitals (para. 6.40(d));

(h) adopt open tenders to increase competition for the provision of maintenance services from the EMSTF and the private sector for medical equipment in Schedule 1 and Schedule 2 hospitals (para. 6.40(g)); and

(i) formulate a strategy for the overall management of medical equipment and, in doing so, take into account the issues identified in this report, and the best practices elsewhere on the management of medical equipment (para. 7.5(a)).

K. **Response from the Administration and the HA.** The Administration and the Chief Executive, HA have generally accepted the audit recommendations.

PART 1: INTRODUCTION

Background

Hospital Authority

1.1 The Hospital Authority (HA) is a statutory body established in December 1990 under the Hospital Authority Ordinance (Cap. 113). The HA is headed by a Chairman and has about 30 members who are appointed by the Government. The Chief Executive, HA is responsible for the overall management of all HA facilities under the policy directions of the HA.

1.2 The HA manages 44 public hospitals/institutions which provide about 29,000 hospital beds, and 49 specialist out-patient clinics. The HA has about 50,000 staff. Its services are largely subvented by the Government. In 2000-01, the Government granted $28,353 million recurrent subvention to the HA, and spent $1,348 million on hospital projects from the Capital Works Reserve Fund (CWRF).

Schedule 1 and Schedule 2 hospitals

1.3 In 1990, the Government passed the management and control of the ex-Government hospitals, known as ***Schedule 1 hospitals***, to the HA. Under this arrangement, certain assets including all medical equipment items were transferred to the HA. The HA also entered into agreements with the individual governing bodies of the ex-subvented hospitals, known as ***Schedule 2 hospitals***, which allowed the HA to manage, control and assume ownership of some of the assets of these hospitals, including all medical equipment items. As at 31 March 2001, there were 21 Schedule 1 hospitals and 23 Schedule 2 hospitals/institutions (hereinafter jointly referred to as hospitals — see Appendix A).

1.4 According to the Report of the then Provisional Hospital Authority of December 1989, upon the establishment of the HA, the then Government hospitals and subvented hospitals would be integrated into a unified system, and placed on an equal footing for resource allocations.

Cluster administration of hospitals

1.5 For the purpose of enhancing the coordination, planning and management of hospital services among different HA medical institutions, since 1993 the HA has grouped most of its hospitals into eight clusters (see Appendix A). In doing so, the HA has taken into account the geographic location of individual hospitals, their traditional roles and functional relationships. The hospitals in each cluster complement and support each other through cross-referral of patients, and sharing of major medical equipment and other clinical support services. The objective is to maximise the use of available resources and avoid duplication or gaps in service provision. Each cluster is supervised by a team of staff of the HA Head Office (HAHO).

Medical equipment

1.6 Medical equipment includes devices connected to patients for their treatment and care in hospitals, and devices used for diagnostic and laboratory purposes. The HA holds a vast array of medical equipment items ranging from less expensive items (such as blood glucose analyzers and nebulizers costing less than $5,000 per unit) to complex and costly equipment items (such as magnetic resonance imaging scanners costing more than $20 million per installation).

1.7 Since the inception of the HA in 1990, the Government has commissioned eight new hospitals (Note 1). The costs of medical equipment for the new hospitals ranged from $4 million for the Wong Chuk Hang Hospital (WCHH) (Note 2) to $484 million for the Pamela Youde Nethersole Eastern Hospital (PYNEH). The costs were largely funded from the CWRF.

1.8 There are about 75,000 items of medical equipment (Note 3) in the 44 HA hospitals. To replace old or non-serviceable equipment items, or acquire new or additional items, the HA procures a substantial number of items of medical equipment each year. The new equipment items are mainly funded from the annual recurrent subvention from the Government or from the CWRF. In 2000-01, the HA spent about $540 million to acquire medical equipment and $324 million on maintenance of equipment. As at 31 March 2001, the estimated total cost of medical equipment managed by the HA amounted to $5.1 billion (Note 4).

HA's Assets Management System

1.9 The HA has developed a computerised Assets Management System (AMS) to facilitate the management of assets, including medical equipment. The AMS is an integrated system through which HAHO users can access asset information maintained in all HA hospitals, except the Queen Elizabeth Hospital (QEH) and the Hong Kong Red Cross Blood Transfusion Service (BTS), which have not implemented the AMS.

Note 1: *The eight new hospitals are: SH, HKEH, PYNEH, WCHH, AHNH, TPH, NDH and TKOH (see Appendix H for their full names).*

Note 2: *The WCHH is an extended care hospital providing infirmary rehabilitation services to elderly patients.*

Note 3: *For the purpose of this review, Audit examined and extracted from the Assets Management System the following asset groups: (a) general medical equipment; (b) clinical training aids and devices; (c) laboratory equipment; (d) diagnostic radiology equipment; (e) radiotherapy equipment; (f) nuclear medicine equipment; (g) medical physics equipment; (h) film and darkroom equipment; (i) allied health diagnostic and therapeutic equipment; (j) pharmaceutical equipment; and (k) medical and surgical instruments, utensils and devices.*

Note 4: *This figure is extracted from the HA's Assets Management System. In 1996, the HA implemented an Assets Management System which, among other functions, records the costs of all medical equipment items costing $5,000 or more per item. Due to the fact that the costs of some equipment items acquired before 1996 were not available, the HA input into the System a standard value of $5,001 per item for 7,367 items (i.e. about 10% of all items of equipment) with unknown value.*

HAHO divisions responsible for medical equipment

1.10 There are four divisions in HAHO which are responsible for the management of medical equipment, namely:

(a) ***Business Support Services Division.*** The Division is responsible for coordinating the procurement of medical equipment items, managing the AMS, conducting the annual resource allocation exercise for major medical equipment, monitoring of the occupational safety and health matters, and overseeing the equipment maintenance by the Electrical and Mechanical Services Trading Fund (EMSTF) and other contractors. The Division has recently embarked on developing scales of provision and standardisation of medical equipment for hospitals;

(b) ***Hospital Planning and Development Division.*** The Division is responsible for the planning of medical equipment requirements for new hospitals or hospital extension projects;

(c) ***Medical Services Development Division.*** The Division conducts assessments of the effectiveness of new medical technologies and their implications on the HA's resources and manpower; and

(d) ***Finance Division.*** The Division manages funding for medical equipment for the HA's hospitals/projects according to the directions of the Chief Executive, HA.

Audit review

1.11 Medical equipment is an important component in the provision of effective medical services. New types of medical equipment have been developed in recent years as a result of rapid medical and technological advancement. Many of these medical equipment items are very expensive in terms of capital and maintenance costs.

1.12 Against the above background, Audit has recently conducted a review of the HA's management of medical equipment. The objectives of the review are to examine the economy, efficiency and effectiveness of the HA's management of medical equipment.

1.13 Audit has observed that improvements can be made in the following areas:

(a) allocation of resources for medical equipment for hospitals (PART 2);

(b) basis of provision of medical equipment for hospitals (PART 3);

(c) procurement of medical equipment (PART 4);

(d) AMS and utilisation of medical equipment (PART 5);

(e) maintenance of medical equipment (PART 6); and

(f) the HA's overall management of medical equipment (PART 7).

1.14 The major areas identified for improvement are as follows:

(a) the Government needs to set up a mechanism for monitoring the furniture and equipment (F&E) expenditure of future hospital projects;

(b) HAHO needs to make improvement to the standards of provision of medical equipment for hospitals;

(c) HAHO needs to provide more flexibility to hospitals in the resource allocation for acquisition of minor medical equipment;

(d) HAHO needs to strengthen the central coordination in the procurement of medical equipment for hospitals;

(e) HAHO needs to enhance the monitoring of utilisation of medical equipment; and

(f) HAHO needs to review the approaches for maintenance of medical equipment and increase the use of open tenders for the maintenance services.

General response from the Administration and the HA

1.15 The **Secretary for the Treasury** agrees that, for future hospital projects, a mechanism should be set up for monitoring the requirements for and costs of F&E.

1.16 The **Chief Executive, HA** has said that the HA generally accepts Audit's recommendations and will take action to implement them in due course.

PART 2: ALLOCATION OF RESOURCES FOR MEDICAL EQUIPMENT

2.1 This PART examines the arrangements for the allocation of resources for the procurement of medical equipment for HA's hospitals.

Classification of medical equipment

2.2 For the purpose of this audit review, Audit has classified the HA's medical equipment items into four categories, as shown in Table 1 below.

Table 1

Audit's classification of medical equipment

Classification	Particulars
Capital equipment	These items are acquired at the time of construction of a new hospital or hospital extension project. Acquisition is funded from the CWRF and approved by the Finance Committee (FC) of the Legislative Council (see paras. 2.3 to 2.40 below);
Major equipment	These items cost $1 million or more per item. Acquisition is funded from the Government's annual subvention to the HA. Allocations of funds to hospitals are conducted through the HA's internal annual resource allocation exercise (see paras. 2.41 to 2.49 below);
Minor equipment	These items cost between $100,000 and less than $1 million per item. Acquisition is funded from the Government's annual subvention to the HA. Annual allocations of funds to hospitals are on a lump-sum basis (see paras. 2.50 to 2.57 below); and
Miscellaneous equipment	These items cost less than $100,000 per item. Acquisition is funded from the Government's annual subvention to the HA. Annual allocations of funds to hospitals are on a lump-sum basis together with provisions for other operating expenses.

Source: HA's records

Funding of hospital projects from the CWRF

2.3 From time to time, based on the Government's development plans, the HA, in coordination with the Health and Welfare Bureau (HWB), builds new hospitals or carries out extension works in existing hospitals, which are funded from the CWRF. After taking into account the construction cost estimates prepared by the Architectural Services Department (ASD), and the F&E cost estimates prepared by the HA, the HWB prepares proposals for new capital works projects to the Finance Bureau (FB) for consideration. Each capital works project proposal sets out the justifications for and the estimated costs of the project. In respect of capital works projects for new hospitals or hospital extensions, the estimated construction costs and the estimated F&E costs (F&E costs include the costs of medical equipment) are included in the project proposals. The proposals are then submitted to the Public Works Subcommittee (PWSC) of the FC of the Legislative Council for vetting, and to the FC for final approval.

2.4 After a capital works project funded by the CWRF has been approved by the FC, the HA starts the construction works and procurement of the medical equipment items. As the Director of Architectural Services is the Controlling Officer of the construction budget, the approval of the ASD is required before committing construction expenditure. Further, as the Secretary for the Treasury has delegated to the Secretary for Health and Welfare the authority to approve the purchase of non-standard F&E (Note 5) for hospital projects, the approval of the HWB is required before committing expenditure for the purchase of non-standard F&E items.

Acquisition of medical equipment for hospitals

2.5 Medical equipment costs usually account for some 80% of the F&E costs of a hospital project. To examine the applications for, and use of, funds from the CWRF for the acquisition of medical equipment items for new hospitals, Audit selected for review three recent hospital construction projects, namely the Alice Ho Miu Ling Nethersole Hospital (AHNH), North District Hospital (NDH) and Tseung Kwan O Hospital (TKOH).

2.6 ***AHNH project.*** In February 1988, the FC approved the reprovisioning of the AHNH from Hong Kong Island to Tai Po. In April 1993, after receipt of fixed-price tenders for the main building contract, the Government submitted a paper to the FC in which it sought approval for the AHNH project (with 642 in-patient beds) at a revised subvention sum of $1,039 million (another sum of $146 million was raised by the AHNH).

2.7 Regarding the F&E provision for the AHNH project, the cost was estimated at $261 million at 1993 prices. It was stated in the FC paper that the estimated cost of F&E would be adjusted in the future in accordance with changes in the Consumer Price Index. Up to 31 July 2001, the HA had committed $251 million (i.e. 96% of the total F&E provision) for the AHNH project.

Note 5: *The Government Property Agency is the approving authority for standard furniture and appliances.*

2.8 ***NDH project.*** In March 1993, the Government decided to construct an acute general hospital with 618 in-patient beds in the North District. In June 1993, in the paper submitted to the FC seeking funds for the design work of the project, it was stated that, in order to fast-track the project, the intention was to base the scope of the NDH project on the AHNH project, with slight adjustment to reflect minor differences in the demographics of the catchment areas of the two hospitals and physical site constraints.

2.9 In November 1993, the Government submitted a paper to the FC in which it sought a subvention of $1,690 million to fund the NDH project. The estimated costs of construction and F&E items at constant prices (i.e. prices at a particular month of a year) and money-of-the-day (MOD — Note 6) prices are shown in Table 2 below.

Table 2

Project estimate of NDH

	March 1993 prices (Constant prices)	**MOD prices**
	($ million)	**($ million)**
Construction cost (Note 7)	959	1,262
F&E cost	290	428
Total	**1,249**	**1,690**

Source: FC paper (FCR(93-94)91)

2.10 The FC was informed in the FC paper of November 1993 that the MOD calculation for F&E was based on the average movement of the import prices of scientific, medical and optical equipment over the past ten years, i.e. 8% a year (Note 8).

Note 6: *MOD prices show the estimated costs of the project after allowing for forecast inflationary increases during the period of construction.*

Note 7: *Up to 31 July 2001, the committed construction expenditure of the NDH was $1,161 million.*

Note 8: *The import prices of scientific, medical and optical equipment are represented by the Import Unit Value Index of Scientific, Medical, Optical, Measuring and Controlling Instruments and Apparatus.*

2.11 It was also stated in the FC paper that:

(a) the responsibility of the day-to-day management of the project would rest with the HA; and

(b) a Steering Committee chaired by the Secretary for Works would control and monitor the project, ensuring that the Government, and not the HA, had the final decision over cost.

The Steering Committee's other members consisted of senior representatives from the HWB, the HA, the FB and the ASD.

2.12 In the project development agreement on the NDH project signed between the Government and the HA, it was stated that:

(a) the purpose of the agreement was to ensure that the building of the project would be completed within budget by the target date of June 1997;

(b) the NDH project was limited to $1,299 million (Note 9) at March 1993 prices. The project would be controlled by the Steering Committee subject to the MOD budget approved by the FC;

(c) **the approved project estimate (APE) in MOD prices should be paid in full to the HA in a single lump sum;**

(d) the lump sum should be used only for the purpose of the project and should be invested in accordance with guidelines approved by the Government;

(e) the interest earned on the lump sum should be paid to the Government annually;

(f) the HA should submit quarterly financial statements to the Government showing the expenditure to date, the balance available and the interest earned;

(g) the F&E and commissioning sections of the budget would be accounted for separately. Funds should not be transferred among the F&E, commissioning and construction budgets without the prior approval of the Steering Committee;

Note 9: *In June 1993, the FC approved $50 million for the preparation work for the NDH project. The total project sum at constant prices was therefore:*

$1,249 million (see Table 2 in para. 2.9 above) + $50 million = $1,299 million

(h) the HA would have the authority to amend the size and detailed provision of the project for budget control or operational reasons without compromising the scope or exceeding the budget; and

(i) any unspent balance in the project account on completion of the project should be repaid to the Government.

The capital works contract of the NDH was a fixed-price lump-sum contract in MOD prices (i.e. tenderers would include in their tender prices their own estimate of inflation over the construction period). In February 1994, a lump sum of $1,690 million, based on the MOD prices of the NDH project, was paid to the HA.

2.13 ***TKOH project.*** In 1994, the Government decided to construct a new hospital in Tseung Kwan O which was targeted for opening in 1999. In February 1995, in a paper submitted to the FC seeking funds for the preparatory work for the TKOH project, it was stated that the HA proposed to build a general acute hospital with 458 in-patient beds and with advanced day treatment facilities to serve the residents of Tseung Kwan O from 1999. Like the NDH project, the Government set up a steering committee under the chairmanship of the Secretary for Works to control and monitor the TKOH project. In July 1995, the Government submitted a paper to the FC in which it sought approval for a grant of $2,047 million to the HA for the construction of the TKOH. Details of the estimated costs of construction and F&E items are shown in Table 3 below.

Table 3

Project estimate of TKOH

	December 1994 prices (Constant prices)	**MOD prices**
	($ million)	**($ million)**
Construction cost (Note 10)	1,105	1,558
F&E cost	292	489
Total	**1,397**	**2,047**

Source: FC paper (FCR(95-96)48)

Note 10: *Up to 31 July 2001, the committed construction expenditure of the TKOH was $1,244 million.*

2.14 It was stated in the FC paper of July 1995 that the contract for the construction works would be on a fixed-price lump-sum basis. The estimations of the MOD construction cost and MOD F&E cost in the FC paper were both based on the Government Economist's forecast of an increasing trend of labour and construction price index movements, which were estimated at 10% a year between 1994 and 1998, and 7.5% a year for 1999 and onwards.

2.15 The Government also signed a project development agreement with the HA on the TKOH project. In the agreement, provisions similar to those of the NDH project (see para. 2.12 above) were included, with the following modifications:

(a) the TKOH project budget was limited to $1,444 million (Note 11) at December 1994 prices; and

(b) the target date of completion of the TKOH project would be July 1999.

In March 1996, a lump sum of $2,047 million, based on the MOD prices of the TKOH project, was paid to the HA.

Monitoring and control of F&E expenditure for hospital projects by HWB

2.16 As stated in paragraph 2.4 above, the HWB is responsible for approving the non-standard F&E expenditure of the AHNH, NDH and TKOH projects. Before acquisition, the HA submitted lists of proposed F&E items for the projects with estimated costs for the approval of the HWB. The HWB examined the proposed F&E lists to ensure that the items applied for were within the scope of the projects and that the accumulated approved F&E expenditure would not exceed the original MOD F&E budgets approved by the FC. It then gave approval for the acquisition of F&E items as listed. The expenditure approved by the HWB was only for procurement of the F&E items stated in the approved lists. Any variations, whether or not incurring the use of savings arising from lower than expected tender prices, would require separate approval of the HWB.

2.17 The funding approvals given by the FC for F&E for the NDH and TKOH projects were based on estimated costs at constant prices and MOD prices (see paras. 2.9 and 2.13 above). Acquisition of F&E items for the NDH and TKOH projects was then based on the approved MOD provision, which included a provision for inflation. (For the AHNH project, acquisition of F&E items was based on the approved provision at constant prices and no allowance for inflation was given.)

Note 11: *In February 1995, the FC approved $47 million for the preparation work for the TKOH project. The total project sum at constant prices was therefore:*

$1,397 million (see Table 3 in para. 2.13 above) + $47 million = $1,444 million

2.18 Up to 31 July 2001, the HWB had given approval in respect of lists of F&E items amounting to $437 million and $463 million, which represented 99% and 95% of the approved MOD F&E costs for the NDH and TKOH projects respectively. (For the AHNH project, the F&E provision approved by the HWB was $260 million, which represented almost all of the $261 million provision approved by the FC.) Both hospitals have already commenced operation: the NDH in February 1998, and the TKOH in December 1999. Details of the F&E expenditure of the two hospital projects are shown in Table 4 below.

Table 4

F&E expenditure of the NDH and TKOH projects up to 31 July 2001

		NDH ($ million)	TKOH ($ million)
(a)	Estimated F&E provision approved by FC at:		
	1st quarter 1993 prices	290	–
	December 1994 prices	–	292
(b)	Inflation allowance approved by FC	138	197
(c)	Forecast total MOD F&E cost before project contingencies (c) = (a) + (b)	428	489
(d)	Funds transferred from project contingencies for additional F&E items	15	–
(e)	Forecast total MOD F&E cost (e) = (c) + (d)	443	489
(f)	F&E provision approved by HWB up to 31 July 2001	437	463
(g)	F&E expenditure committed by HA up to 31 July 2001	300	276

Source: HA's records and FC papers — FCR(93-94)91 and FCR(95-96)48

2.19 ***Approved F&E expenditure for the AHNH, NDH and TKOH.*** As stated in paragraph 2.8 above, in the paper submitted to the FC in June 1993, it was stated that the provision for the NDH project was based on the scope of the project on the AHNH, with slight adjustment to reflect minor differences in the demographics of the catchment areas of the two hospitals and physical site constraints. Regarding the TKOH project, the scope and basis of provision of F&E were not stated in the FC paper.

2.20 Table 5 below shows the planned number of beds in and F&E provisions for the three hospitals. Details of the hospital beds and ambulatory care services provided in the three hospitals are shown at Appendix B.

Table 5

Planned number of beds and F&E provisions for the AHNH, NDH and TKOH

		AHNH	NDH	TKOH
(a)	Planned number of in-patient beds	642	618	458
(b)	Planned number of day beds in Day Procedure Centre	–	40	–
(c)	Planned number of day care places	180	80	140
(d)	F&E provision approved by HWB up to 31 July 2001	$260 million	$437 million	$463 million
(e)	F&E expenditure committed by HA up to 31 July 2001	$251 million	$300 million	$276 million
(f)	Hospital commenced operation in	January 1997	February 1998	December 1999

Source: HA's records and FC papers — FCR(93-94)12, FCR(93-94)91 and FCR(95-96)48

2.21 Up to 31 July 2001, the HWB had given approval to the HA to spend $260 million, $437 million and $463 million on F&E for the AHNH, NDH and TKOH projects respectively. There are fewer number of beds in the NDH and TKOH than in the AHNH. Audit notes that the F&E provisions approved by the HWB for the NDH and TKOH are considerably higher than that for the AHNH. In September 2001, Audit enquired the HA about the reasons for the variations.

2.22 In response to Audit's enquiry, the HA stated that variations in the provision of medical equipment for different hospitals should be regarded as a norm rather than exception, and that:

(a) hospitals could not be regarded as identical facilities without taking into account the bed-mix, the sophistication and comprehensiveness of services provided in each specialty;

(b) hospitals having similar number of beds did not necessarily imply that they should have similar medical equipment requirements; and

(c) bed provisions were only one of the many components of a hospital. Other components included out-patient services, ambulatory and day care services, diagnostic and treatment services, etc.

Monitoring and control of F&E expenditure for hospital projects by FB

2.23 ***Provision for inflation in project estimates.*** Before 1995, project estimates were normally expressed at constant prices, i.e. prices as at a particular month of a year. In the early 1990s, the FB adopted MOD estimates for some Airport Core Programme projects. MOD project estimates show the estimated cost of a project after allowing for forecast inflationary increases in construction prices for the duration of the period of construction. The reason for the adoption of MOD project estimates was that the FB wished to have a higher degree of budgetary certainty about final project outturn costs.

2.24 With effect from 1 April 1995, non-Airport Core Programme public works projects and capital subvention building projects funded under the CWRF would also use MOD project estimates. As stated in Financial Circular No. 4/95, with effect from 1 April 1995, all PWSC papers need to provide:

- project estimates at constant prices and their MOD equivalents, including the basis for estimating the MOD equivalents; and

- cost breakdown for the project, including an item called "inflation allowance", which is the difference between the constant-price project estimate, including the contingency sum, and the MOD project estimate.

2.25 Financial Circular No. 4/95 also states that the FB will from time to time announce price adjustment factors to be used for converting constant prices into MOD prices. The MOD project estimate will form the APE of the project for the approval of the FC.

2.26 **A key message in Financial Circular No. 4/95 is that Controlling Officers should endeavour to use the inflation allowance only to meet inflationary price increases, and should not use the inflation allowance as a secondary contingency item to pay for real increases in the cost of the project due to unforeseen works items, although some slight flexibility may be allowed.** In early October 2001, in response to Audit's request for clarification on the circular, the FB said that:

(a) as works contracts progress, it was not unusual for Controlling Officers to make minor variations to the contracts and these might spread over a number of years;

(b) it would not always be practical for the Controlling Officers to ascertain exactly how much of such price variations, when compared with the original estimate expressed in constant price of the year the project was upgraded to Category A, was purely attributable to price adjustments, changes in scope, or a combination of price and scope changes; and

(c) therefore, Controlling Officers needed to be allowed some flexibility, provided that the expenditure incurred fell within the project scope approved by the FC, and did not exceed the cash-limited control figure, i.e. the APE in MOD prices.

2.27 ***Savings in projects.*** Financial Circular No. 4/95 states that the FB will determine the differences in dollar terms between the original MOD APE and the latest forecast outturn MOD cost. In case there are savings, the FB will apply deflation factors to deflate the MOD savings to the current Resource Allocation Exercise constant-price base to determine the constant-price savings that can be quoted to fund new projects, or to cover real cost increases in existing projects.

Audit observations on acquisition of medical equipment for hospitals

2.28 ***Audit examination of savings arising from lower outturn MOD costs for F&E for the NDH, TKOH and AHNH projects.*** Audit attempted to ascertain whether there were any savings arising from lower outturn MOD costs for F&E for the NDH, TKOH and AHNH projects. Audit found that:

(a) in respect of the NDH project (see paras. 2.9 and 2.10 above), the provision of inflation for F&E was **$138 million** ($428 million – $290 million). This was based on the average movement of Import Unit Value Index of Scientific, Medical, Optical, Measuring and Controlling Instruments and Apparatus (IUVI) over the ten-year period up to 1993, which was estimated at 8% a year during the construction/commissioning of the NDH project;

(b) in respect of the TKOH project (see paras. 2.13 and 2.14 above), the provision of inflation for F&E was **$197 million** ($489 million − $292 million). This was based on the Government Economist's forecasts of the trend of labour and construction price index movements, which were estimated at 10% inflation a year between 1994 and 1998, and 7.5% a year for 1999 and onwards; and

(c) in respect of the AHNH project, no inflation allowance for F&E was included in the FC paper for funding approval for the project.

2.29 However, Audit notes that the actual outturns of IUVI and labour and construction price index are lower than the forecasts stated in the FC papers of the NDH project and the TKOH project. Table 6 below shows the forecasts and actual outturns of these two indices.

Table 6

Forecast and actual outturn inflation rates for F&E for the NDH and TKOH projects

	IUVI (for the NDH project)		Labour and construction price index (for the TKOH project)	
Year	**Forecast rate stated in the FC paper of November 1993**	**Actual outturn rate (Note 1)**	**Forecast rate used to determine the financial implications in the FC paper of July 1995**	**Actual outturn rate (Note 2)**
1994	8%	**–2.9%**	N/A	**N/A**
1995	8%	**–2.2%**	10%	**7.8%**
1996	8%	**–1.1%**	10%	**7.3%**
1997	8%	**–0.9%**	10%	**9.1%**
1998	8%	**–3.3%**	10%	**8.7%**
1999	8%	**–5.7%**	7.5%	**2.7%**
2000	8%	**–0.2%**	7.5%	**–0.5%**

Source: FB's Financial Circulars, FC papers — FCR(93-94)91 and FCR(95-96)48, and Census and Statistics Department's records

Note 1: These actual outturn rates are calculated by Audit based on the IUVI compiled by the Census and Statistics Department (see also Note 8 to para. 2.10 above).

Note 2: These actual outturn rates are calculated by the FB.

2.30 Concerning the use of the IUVI (as stated in the FC paper of November 1993) as a measure of price movements of F&E for the NDH project, in response to Audit enquiries, in September 2001 the HWB and HA said that there were limitations of the IUVI in reflecting import price movements of medical equipment. The HWB said that:

(a) of the 86 types of equipment items included in the IUVI, only nine types belonged to the medical category;

(b) the value of medical equipment items only represented 16% of the total value of all the equipment items used in calculating the IUVI; and

(c) the medical items used in the calculation of the IUVI were consumables, instruments or appliances, instead of capital equipment. These medical items made up a small portion of Category F F&E items (i.e. medical instruments) in the NDH and TKOH projects. These Category F items only represented about 5% of the approved F&E budgets for the NDH and TKOH projects.

2.31 The HA also said that:

(a) many major medical equipment items, such as computed tomography scanner, angiographic/fluoroscopic X-ray machines, linear accelerators, etc. were constantly being enhanced to harness technological advancement and meet changes in treatment methods; and

(b) the IUVI did not capture the cost due to changes in quality and sophistication of medical equipment (Note 12).

Need to ascertain actual inflation allowance

2.32 **As shown in Table 6 in paragraph 2.29 above, the actual outturn inflation rates for F&E for the NDH and TKOH projects are lower than the forecast inflation rates. Audit has suggested that the FB, in collaboration with the HWB, should conduct a review to ascertain the amounts of inflation allowance required for F&E for the NDH and TKOH projects (see para. 2.27 above).** In response to Audit's observations, in October 2001 the FB stated that:

(a) the main objective of requiring Controlling Officers to update their forecast requirements in MOD terms was to avoid resources being locked up unnecessarily by Category A projects, which might have the effect of crowding out other essential capital works projects in the annual resource allocation exercise;

Note 12: *If IUVI was not a sufficiently representative index to reflect changes in prices of medical equipment, it is questionable why the IUVI was used to estimate the MOD cost of F&E for the NDH project in the relevant FC paper (see para. 2.10 above).*

(b) in the case of the NDH and TKOH projects, the point made in sub-paragraph (a) was not directly relevant. This was because the Government already paid to the HA the APE in MOD prices in full at the beginning of the projects. Hence, the usual control to avoid crowding out resources for other government capital works projects did not apply; and

(c) the arrangements set out in Financial Circular No. 4/95 did not strictly apply to the NDH and TKOH projects (Note 13). This was because the arrangements for the two projects were different from those for usual government capital works projects and other HA subvented projects. In these two projects:

(i) the funding arrangements were governed by two project development agreements (see paras. 2.12 and 2.15 above); and

(ii) under the agreements, the Government already paid to the HA the APE in MOD prices in full at the beginning of the projects (Note 14).

2.33 In response to Audit's observations in paragraph 2.32 above, in October 2001 the HWB stated that:

(a) in accordance with the project development agreements, the objective of adopting the arrangement for the HA to be entrusted by the Government to carry out the NDH and TKOH projects was to ensure that the two projects could be completed within budget and by the target dates;

(b) in drawing up the F&E budgets for the NDH and TKOH projects, the use of the forecast IUVI or the labour and construction price index was only a budgetary approach which aimed to include inflation elements in the budgets;

(c) there was no mechanism under the project development agreements which allowed the Government to unilaterally reduce the approved budget ceiling;

(d) the HWB had not been informed that the F&E MOD budget would need to be adjusted during the implementation of the projects;

Note 13: *Audit notes that Financial Circular No. 4/95 states that the new requirements set out in the Circular will also apply to capital subvention building projects funded under Head 708 of the CWRF. The NDH and TKOH projects are funded under Head 708 of the CWRF.*

Note 14: *According to the project development agreements for the NDH and TKOH projects, any unspent balance in the project accounts on completion of the projects should be repaid to the Government (see para. 2.12(i) above). Audit therefore considers it necessary for the FB to ascertain the amounts of inflation allowance required for F&E for the two projects because of lower than originally expected rates of inflation.*

(e) although the forecast IUVI or the labour and construction price index adopted in drawing up the F&E budgets for the NDH and TKOH projects in hindsight might turn out to be lower, this did not automatically follow that the prices of the medical equipment actually purchased for the NDH and TKOH would have experienced reductions similar to the IUVI or the labour and construction price index;

(f) actual inflation would have been reflected in the actual tender price of each item of equipment purchased. The difference between the approved estimate for each F&E item and its actual tender price would accrue in the concerned project account;

(g) in accordance with the project development agreements, any unspent balances in the project account would be returned to the Government on completion of the projects; and

(h) the funding arrangements for the NDH and TKOH projects were governed by two project development agreements, and the arrangements set out in Financial Circular No. 4/95 did not strictly apply.

Room for improvement in stating the basis of provision of F&E items in FC papers

2.34 When applying for funds for the AHNH project, a list showing the major equipment items (together with the estimated costs) was attached to the FC paper of April 1993. However, for the NDH and TKOH projects, a similar list was not mentioned in the FC papers of the two projects.

2.35 **Audit considers that, in the FC papers applying for funds for hospital projects, the basis of provision of F&E expenditure should be stated. The basis should preferably be in the form of a list of major F&E items with estimated costs. Such a list would be useful to the HWB and FB in its future monitoring of F&E expenditure. Alternatively, based on the F&E and construction costs in previous hospital projects, the FB could determine a percentage of the construction cost as F&E cost.**

2.36 In response to Audit's enquiries about the basis of provision of F&E expenditure, in September 2001:

(a) the HWB stated that, given the rapid development in medical technology and the evolving mode of delivery of public hospital services to meet changes in the demand for and standards of public hospital services, it was impracticable and not cost-effective to require the HA to compile an initial list of major F&E with estimated costs during the preparation of the FC paper for a hospital project. This was because the items in the list could be outdated and many alterations would be required when most of the F&E items were purchased some four to five years after the FC had approved the project; and

(b) the HA stated that, with constant development in medical technology and treatment modalities, any list of F&E items prepared at the time of funding application would often require appropriate readjustments in quantity and modifications of technical specifications

when F&E items were eventually procured in phases. Even if a list were compiled, it would serve little meaningful purpose in the monitoring of F&E expenditure.

Audit recommendations on acquisition of medical equipment for hospitals

2.37 **Audit has *recommended* that, to exercise proper control of F&E costs of hospital projects estimated on MOD basis, the Secretary for the Treasury, in collaboration with the Secretary for Health and Welfare, should:**

(a) **before the commencement of future hospital projects, agree with the HA a mechanism for establishing the F&E requirements and for monitoring the acquisition of F&E items; and**

(b) **in future FC papers for hospital projects, state the basis of provision of F&E expenditure (e.g. indicating the F&E expenditure expressed as a percentage of the estimated construction cost of the hospital based on previous hospital projects, or alternatively providing a list of major F&E items).**

Response from the Administration

2.38 The **Secretary for the Treasury** has said that:

(a) the FB accepts that the Steering Committees for future HA projects should at the beginning of the projects consider and agree with the HA a mechanism for monitoring the requirements for and costs of F&E; and

(b) the FB supports the recommendation in paragraph 2.37(b) above.

2.39 The **Secretary for Health and Welfare** has said that:

(a) based on past experience, the use of construction cost at constant prices to estimate the required F&E provision is a reasonable basis to gauge the F&E needs of a hospital (Note 15); and

(b) construction cost is directly related to the gross floor area of a hospital and the complexity of the accommodation requirements, which in turn reflects the extent of the F&E provision required.

Note 15: *Based on the relevant FC papers, the percentages of estimated F&E costs (as a percentage of estimated construction cost at constant prices) for the three hospitals involved were:*

AHNH — 28%;
NDH — 30%; and
TKOH — 26%.

Response from the HA

2.40 The **Chief Executive, HA** has said that the Government should include F&E budget as a percentage of the construction cost (at constant prices).

Annual HA resource allocation exercises for major medical equipment

2.41 Applications from HA's hospitals for acquisition of major medical equipment require the approval of the Chief Executive, HA through the annual resource allocation exercises. In April each year, HAHO issues a call circular to all Hospital Chief Executives (HCEs) inviting applications for acquisition of major medical equipment in the next three financial years (Note 16). HCEs are required to complete a standard acquisition form for each item of major medical equipment they apply for, giving justifications for the acquisition. The key information required in the application form includes the following:

(a) estimated equipment cost;

(b) annual maintenance costs;

(c) whether the equipment is a new, additional or replacement item;

(d) current and/or expected utilisation;

(e) similar equipment items currently available in the hospital, or in other hospitals of the same cluster, or other clusters;

(f) the current operating condition and frequency of breakdown of the equipment to be replaced in the past years; and

(g) the number of patients treated and on the waiting lists, and the waiting time for treatment.

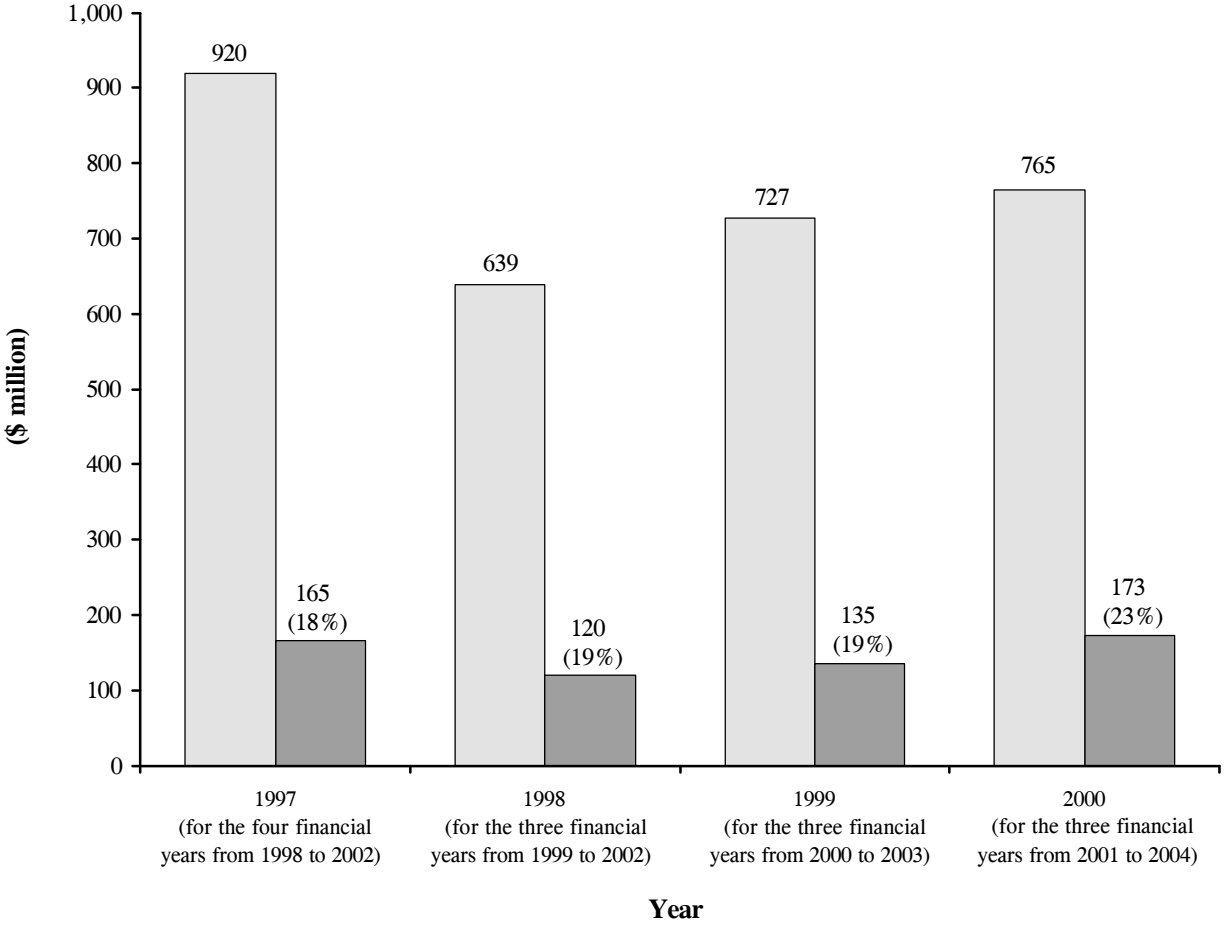
2.42 HCEs have to prioritise the items of equipment they apply for. HAHO classifies the applications from all the hospitals according to their clusters and specialties. Thereafter, HAHO seeks the comments of the cluster coordinators and specialty coordinating committees (COCs). The HA has eight cluster coordinators and 30 COCs. For each item of major equipment being applied for, the cluster coordinator and chairman of the COC are required to indicate whether they "strongly support", "support" or "do not support" the application.

Note 16: *For some specific items, such as linear accelerators, HAHO has an overall plan for replacement. Hospitals are not required to submit applications for such equipment items.*

2.43 Based on the comments of the cluster coordinators and COCs, the Chief Executive, HA gives approvals for acquisition of major equipment items around November. Figure 1 below shows the values of major medical equipment applied for by hospitals, and the values of equipment approved by the Chief Executive, HA, in the last four annual resource allocation exercises.

Figure 1

Application for and approval of acquisition of major medical equipment between 1997 and 2000



Source: HA's records

Note 1: Average amount of major medical equipment applied for by hospitals each year was $763 million.

Note 2: Average amount of major medical equipment approved by the Chief Executive, HA each year was $148 million.

Audit observations on acquisition of major medical equipment

2.44 It is shown in Figure 1 above that, in the recent four resource allocation exercises, of the average amount of $763 million of major medical equipment applied for by hospitals each year, the Chief Executive, HA only approved $148 million (i.e. averaging only 19%). In terms of number of major equipment items, the 44 HA hospitals had applied for 210 items on average, but only 38 items (or 18%) were approved by the Chief Executive, HA.

2.45 More than 80% of the major medical equipment applied for by the hospitals was not approved by the Chief Executive, HA. Considerable efforts were spent by the various hospitals in preparing as well as processing the documentation required for the applications. Furthermore, Audit is not aware that HCEs were formally informed of the reasons for the unsuccessful applications. This could lead to re-submission of applications to acquire the same items. There is a need for better liaison among HAHO, cluster coordinators, COCs and HCEs.

2.46 **Audit considers that the HA should conduct a review of the process of allocation of resources for acquiring major equipment with a view to improving the whole process. For example, the HA may consider informing beforehand the cluster coordinators and COCs the approximate amount of resources available, and asking them to prioritise the items requested by the hospitals. This would facilitate the processing of the applications in HAHO for approval by the Chief Executive, HA, and improve the efficiency and effectiveness of the HA's resource allocation exercise.**

2.47 **Audit also considers that the HA may let the HCEs know the reasons of the cluster coordinators and/or COCs for not supporting the funding bids for major equipment. This would also help reduce administrative work and improve the efficiency of the resource allocation exercise.**

Audit recommendations on acquisition of major medical equipment

2.48 **Audit has *recommended* that, in respect of the annual resource allocation exercise for acquisition of major medical equipment, the Chief Executive, HA should:**

(a) **review the whole process with a view to reducing the HA's corporate efforts spent on the exercise; and**

(b) **inform the HCEs the reasons of the cluster coordinators and COCs for not supporting their applications for acquisition of major medical equipment.**

Response from the HA

2.49 The **Chief Executive, HA** has said that the HA will implement Audit's recommendations in paragraph 2.48 above.

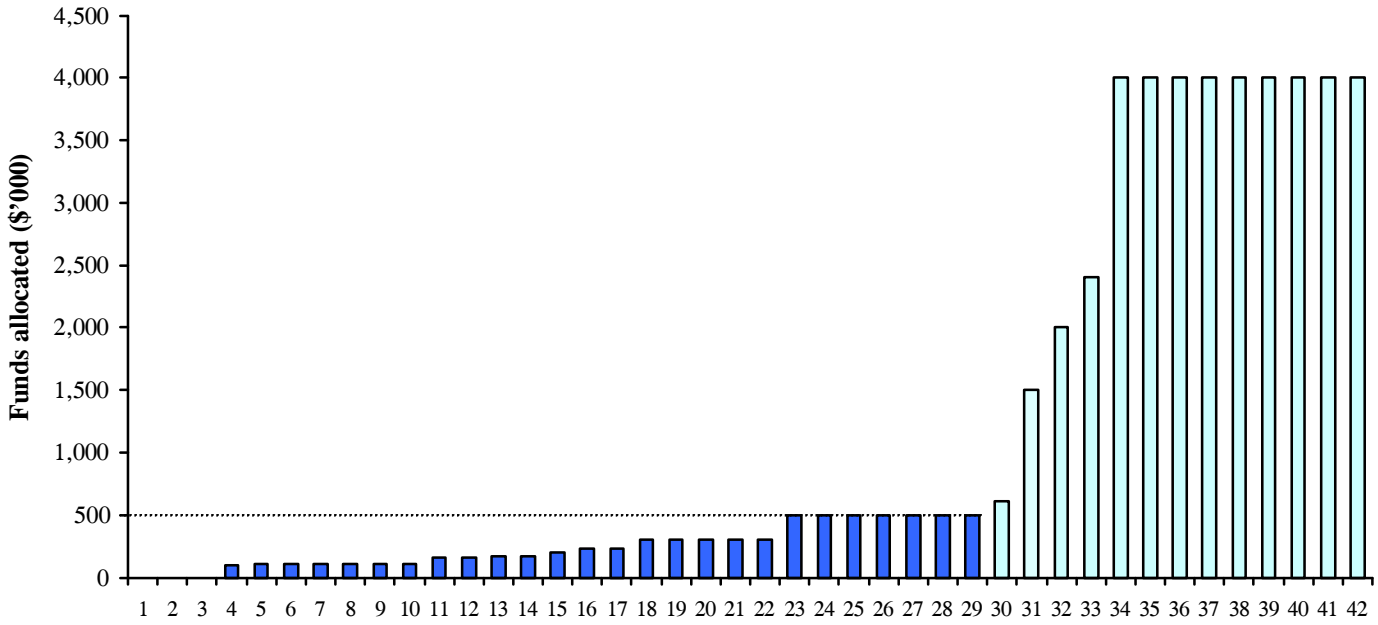
HA's resource allocation system for minor medical equipment

2.50 Allocation of resources for acquisition of minor medical equipment items (costing between $100,000 and less than $1 million) is made annually from HAHO to the hospitals, and is largely based on the scale of operations of hospitals. (In addition to the annual allocations, hospitals may apply for special allocations.) Each hospital is allocated a different lump sum each year. The amounts of funds allocated to the 42 HA hospital units (Note 17) for acquisition of minor medical equipment in 2001-02 are shown at Appendix C.

2.51 An audit analysis of the annual allocations of funds for acquisition of minor medical equipment revealed that, in 2001-02, of the total 42 HA hospital units, only 12 major hospital units received $1 million or more. Figure 2 below shows the distribution of funds for minor medical equipment allocated to the 42 hospital units in 2001-02.

Figure 2

Allocation of funds for minor medical equipment to 42 hospital units in 2001-02



Source: HA's records

Note 17: *The Ruttonjee Hospital (RH) and Tang Shiu Kin Hospital (TSKH) were considered as one hospital unit for the purpose of allocation of funds for minor medical equipment. The same arrangement also applied to the NDH and Fanling Hospital (FH). Therefore, the number of hospital units for the purpose was 42 (44 – 2).*

Audit observations on acquisition of minor medical equipment

More flexibility needed in the use of resources to acquire minor medical equipment

2.52 It can be seen from Figure 2 above that, of the total 42 HA hospital units involved, 29 (69%) were each allocated $0.5 million or less for acquisition of minor medical equipment in 2001-02. These hospitals therefore had not been allocated resources which would enable them to acquire a minor equipment item costing more than $0.5 million (Note 18). Audit notes that these hospitals may apply for special allocations, use the unspent provisions of the previous years, or use current year's provisions for operating expenses for acquisition of minor equipment items. The HA's records showed that 12 major hospital units were each allocated funds between $1.5 million and $4 million for minor medical equipment in each of the past few years.

2.53 A possible problem arising from this method of resource allocation is that a hospital might have urgent needs in a year that would exceed the amount allocated to it in that year. In the same year, another hospital might not need to use the funds allocated to it.

2.54 As shown in paragraph 1.5 above, the HA has since 1993 introduced a cluster system for the administration of hospitals. One of the objectives of the cluster system is to enhance the coordination, planning and management of services among different hospitals in the same region. Under the system, hospitals in each cluster complement and support each other through sharing of major medical equipment.

2.55 **In view of the problems mentioned in paragraphs 2.52 and 2.53 above, Audit considers that the HA can allocate the resources for minor medical equipment on the basis of clusters of hospitals. This method of resource allocation has the following advantages:**

(a) **in terms of resource management, it provides more flexibility to all the hospitals in a cluster in the acquisition of minor medical equipment items; and**

(b) **it also enables hospitals in a cluster to acquire minor medical equipment items according to the priority of the items in the cluster.**

Audit recommendations on acquisition of minor medical equipment

2.56 **Audit has *recommended* that the Chief Executive, HA should:**

Note 18: *Hospitals can apply for equipment items costing $1 million or more in the HA's annual resource allocation exercises for major medical equipment (see Table 1 in para. 2.2 above).*

(a) **consider allocating resources for the acquisition of minor medical equipment on the basis of clusters of hospitals (instead of allocating them directly to each hospital); and**

(b) **ask the cluster coordinators to compile a priority list of the minor medical equipment, having regard to the justifications for each application and the needs of the hospitals in a cluster.**

Response from the HA

2.57 The **Chief Executive, HA** has said that the HA will:

(a) implement Audit's two recommendations stated in paragraph 2.56 above in due course; and

(b) in the course of implementing the recommendations, dovetail the changes with the development of the new cluster arrangements.

PART 3: BASIS OF PROVISION OF MEDICAL EQUIPMENT FOR HOSPITALS

3.1 This PART examines the basis of providing medical equipment for HA hospitals.

Scale of provision for commonly-used medical equipment

3.2 In early 1998, the HA launched a pilot scheme to introduce a scale of provision (SOP) for commonly-used medical equipment in hospitals. Three types of commonly-used medical equipment, referred to as SP1 to SP3 (see Appendix D) were selected to implement the pilot scheme. In late 1998, HAHO invited comments from eight major hospitals (namely QMH, QEH, PMH, PWH, TMH, KWH, UCH and YCH — see Appendix H) on the proposed SOPs for the three types of selected medical equipment, **which were largely determined on a per bed basis.** In early 1999, the SOPs for the three types of equipment were finalised and approved for implementation.

3.3 In early 1999, HAHO extended the pilot scheme on the SOP to another eight types of medical equipment, referred to as SP4 to SP11 (see Appendix D). In late 1999, the SOPs for SP4 to SP11 were approved for implementation. Based on the eleven approved SOPs, HAHO has asked hospitals to review their stock of the eleven types of medical equipment to identify whether there were surpluses or shortfalls of equipment items.

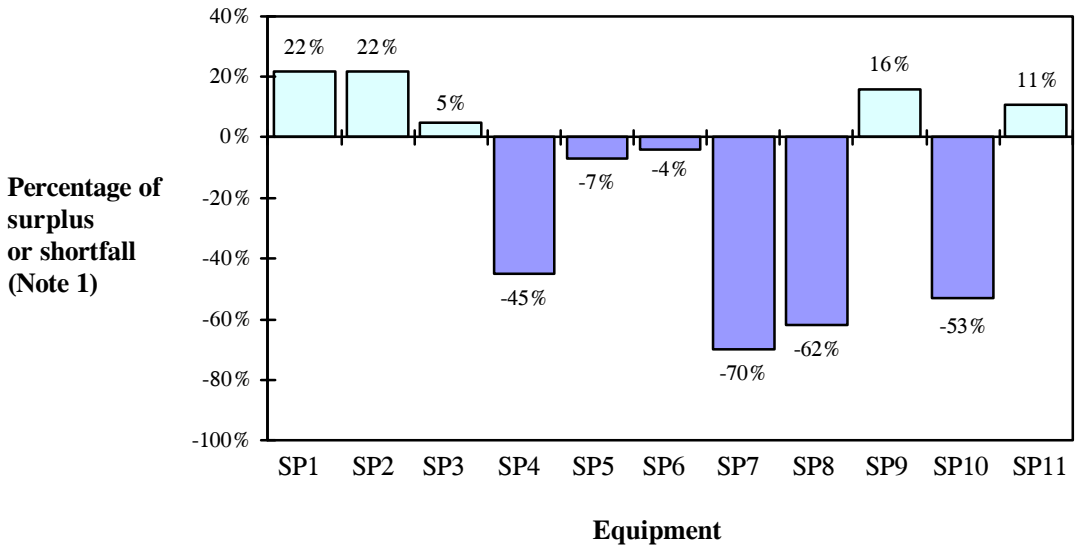
Audit observations on SOP for commonly-used medical equipment

3.4 With the assistance of the HA, Audit conducted an examination to find out whether there were surpluses or shortfalls of equipment items, based upon the approved SOPs for the eleven types of medical equipment. The medical equipment lists of four hospitals (randomly selected) were selected for review, namely the TMH, PYNEH, CMC and UCH (see Appendix H). The results are shown in Figure 3 below.

Figure 3

Surplus or shortfall of medical equipment based on the approved SOPs for eleven types of medical equipment as at 29 February 2000

(a) PYNEH



(b) TMH

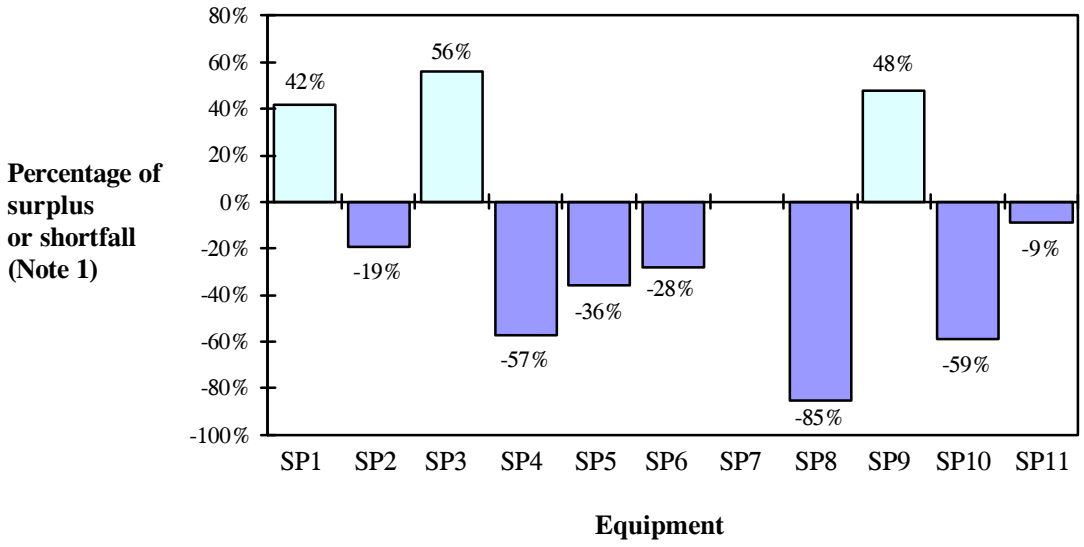
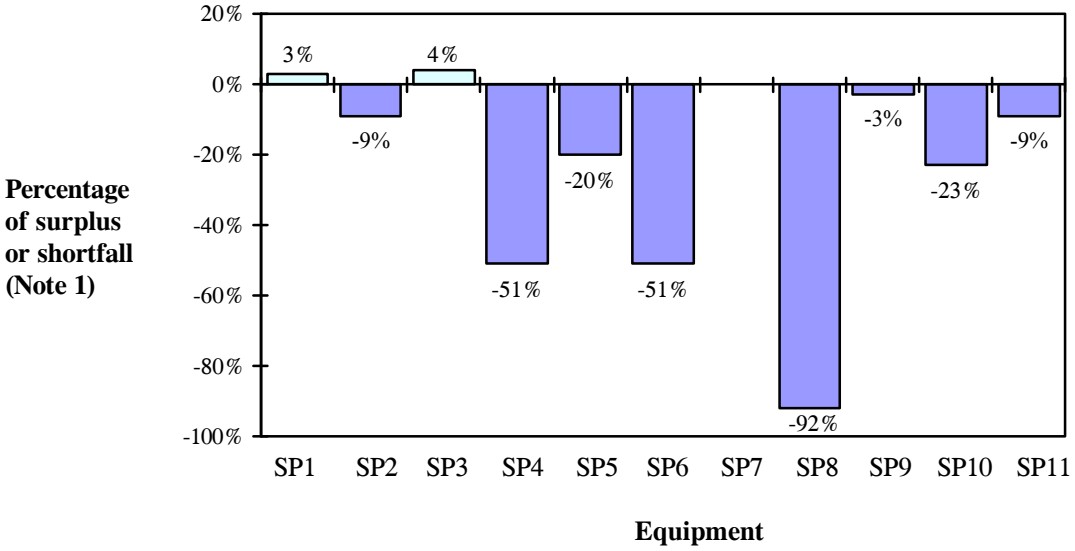
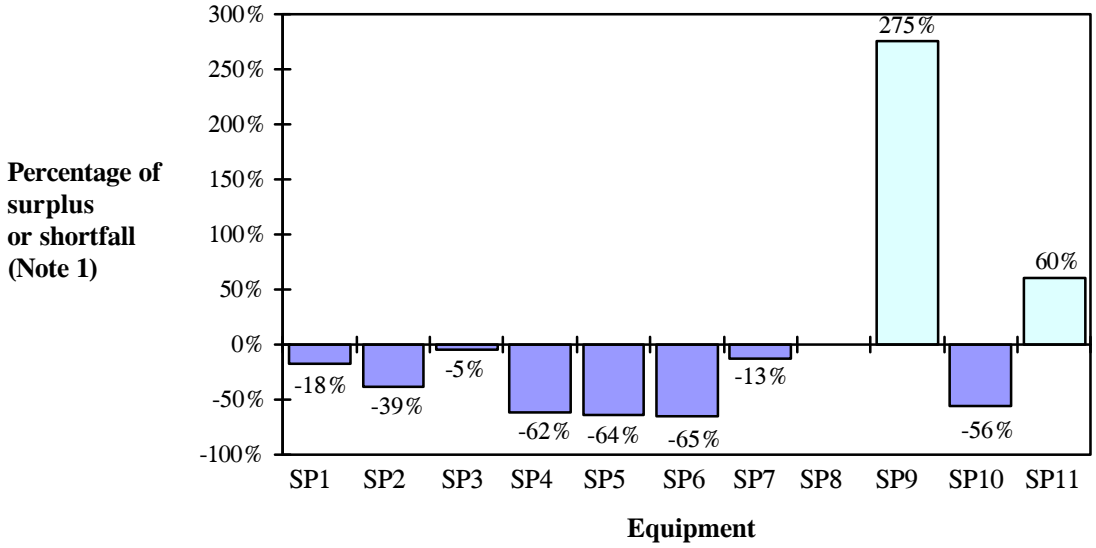


Figure 3 (Cont'd)

(c) UCH



(d) CMC



Source: *HA's records*

Note 1: *The percentages of surplus or shortfall are calculated using the following formula:*

(Items of equipment available − Items of equipment based on SOP) ÷ Items of equipment based on SOP × 100%

Note 2: *Some hospitals did not maintain records on equipment items costing below $5,000 per item. Therefore, the percentages of surpluses or shortfalls of SP7 and SP8 could not be determined for some hospitals.*

Note 3: *For details of these eleven types of medical equipment, see Appendix D.*

3.5 Based on the approved SOPs for the eleven types of medical equipment, there were more equipment shortfalls than surpluses in the four selected hospitals. The extent of shortfalls was significant. For example, of the eleven types of equipment in the UCH, there were shortfalls in eight types (73%), ranging from 3% to 92%. The CMC also had eight types of equipment with shortfalls, ranging from 5% to 65%. The most significant shortfalls were as follows:

Hospital	Equipment type	Shortfall
CMC	SP6 — Blood pressure monitor, non-invasive	65%
PYNEH	SP7 — Blood glucose monitor	70%
TMH	SP8 — Carbon dioxide monitor transcutaneous	85%
UCH	SP8 — Carbon dioxide monitor transcutaneous	92%

3.6 In response to Audit's observations in paragraphs 3.4 and 3.5 above, in September 2001 the HA said that:

(a) the following factors should be taken into consideration in interpreting the audit findings:

(i) certain types of medical equipment could perform similar or partial functions of another type of medical equipment at a less sophisticated level; and

(ii) certain types of minor equipment costing below $5,000 each might not be shown in the AMS; and

(b) despite the vast array of medical equipment, the existing SOPs developed by the HA had facilitated a broad benchmark comparison of equipment holdings among healthcare services.

3.7 **Audit considers that the significant shortfalls of medical equipment in some hospitals based on the SOP (see para. 3.5 above) indicate that improvements to the provision of some common items of medical equipment are needed.** As a healthcare service of a hospital might require different types of medical equipment with functions similar to those used in another hospital, there might be difficulties in implementing a scheme of standard provision of medical equipment based on each type of equipment. Audit considers that a more effective way is to implement a scheme of standard provision of medical equipment on the basis of each type of healthcare service. For example, a standard number and types of medical equipment items could be determined based upon the number of beds assigned to a healthcare service (e.g. orthopaedics) in a hospital.

3.8 Audit notes that, during the promulgation of the SOPs for the eleven types of medical equipment, HAHO has asked hospitals to flexibly adopt the SOPs to cater for local conditions. **Audit considers that, in order that a scheme of standard provision of medical equipment can be successfully implemented, HAHO should ensure consistency in the implementation of the SOP. Hospitals which require variations to the approved standards need to provide justifications to HAHO.**

Audit recommendations on SOP for commonly-used medical equipment

3.9 **Audit has *recommended* that the Chief Executive, HA, should:**

(a) **take action to ascertain the reasons for the significant shortfalls of medical equipment based on the SOPs;**

(b) **make improvements to the standards and criteria for the provision of commonly-used medical equipment in hospitals;**

(c) **take action to rationalise the distribution of medical equipment among hospitals;**

(d) **in the implementation of the standard of provision of medical equipment, ensure consistency among different hospitals and only approve exceptional cases which are supported by adequate justifications; and**

(e) **use the standard of provision of medical equipment to support applications for medical equipment in future hospital projects.**

Response from the HA

3.10 The **Chief Executive, HA** has said that:

(a) the HA will investigate the significant shortfalls of medical equipment based on the SOPs;

(b) the HA has commenced a rationalisation process since early 2001 to transfer surplus medical equipment to hospitals with underprovision of the equipment; and

(c) the HA will consider the recommendations stated in paragraph 3.9 above.

PART 4: PROCUREMENT OF MEDICAL EQUIPMENT

4.1 This PART examines the arrangements for the procurement of medical equipment, and the roles and responsibilities of HAHO and HA hospitals in the procurement process.

Rules and regulations on procurement of medical equipment

4.2 The HA has issued a "Procurement and Materials Management Manual" to all hospitals for compliance. The manual has laid down regulations, directions and guidelines on various procurement and material management functions of HAHO and hospitals. Among others, the manual has laid down the guideline that:

> *"As a procurement agent to the HA, the Government Supplies Department (GSD) is providing certain procurement services for goods and supplies except services to all Schedule 1 hospitals. Limited services have been extended to some Schedule 2 hospitals by special arrangement. HAHO and* ***all Schedule 1 hospitals*** *are authorised to issue tenders for the purchase of goods and equipment, excluding drugs and bulk contract items, up to* ***$1,000,000*** *without recourse to GSD. Prior to the establishment of a service level agreement between GSD and HA, approval of HAHO must be sought for further extension or termination of GSD's services." (Audit's emphasis)*

4.3 In order to reduce procurement costs and to achieve economies of scale, the manual also states that hospitals should, as far as possible, give priority to acquiring supplies or services from the following sources:

(a) the unallocated store of the GSD, if it meets users' requirements;

(b) contracts of bulk supplies or services coordinated by HAHO; and

(c) nominated suppliers of selected supplies or services appointed by HAHO under the Nominated Product Scheme (NPS).

4.4 In addition to the above three sources of supply, individual hospitals may make procurement themselves. The procedures for acquisition of different medical equipment items according to their values are summarised in Table 7 below.

Table 7

Procedures for acquisition of medical equipment

Value of each item of equipment	Procedures hospitals should comply with
$1,500 or below	Quotations are not required.
$1,501 to $20,000	More than one verbal or written quotation are required.
$20,001 to $50,000	Two or more written quotations are required.
$50,001 to $200,000 [for 19 smaller-scale hospitals (Note 1)] $50,001 to $500,000 [for 25 larger-scale hospitals (Note 2)]	Five or more written quotations are required.
$200,001 to $1 million [for 19 smaller-scale hospitals] $500,001 to $1 million [for 25 larger-scale hospitals]	Tenders are required through the related Hospital Subsidiary Tender Board chaired by the HCE.
Over $1 million to $10 million [for Schedule 1 hospitals]	Tenders are required through the GSD Tender Board chaired by the Deputy Director of Government Supplies.
More than $10 million [for Schedule 1 hospitals]	Tenders are required through the Central Tender Board chaired by the Secretary for the Treasury.
Over $1 million to $2 million [for Schedule 2 hospitals]	Tenders are required through the related Hospital Tender Board chaired by a non-staff member of the Hospital Governing Committee of the hospital.
More than $2 million [for Schedule 2 hospitals]	Tenders are required through the related Special Hospital Tender Board chaired by a non-staff member of the Hospital Governing Committee of the hospital.

Source: HA's records

Note 1: The 19 smaller-scale hospitals are BBH, CCH, SCH, DKCH, FYKH, HHH, BH, HKEH, BTS, LCKH, MMRC, NLH, OLMH, RC, SLH, SJH, TYH, TWEH and WCHH (see Appendix H for their full names).

Note 2: The 25 larger-scale hospitals are AHNH, CMC, CPH, GH, KCH, KH, KWH, NDH, FH, PYNEH, POH, PWH, PMH, QEH, QMH, RH, TSKH, SH, TPH, TKOH, TMH, TWH, UCH, WTSH and YCH (see Appendix H for their full names).

Audit observations on procurement of medical equipment

Schedule 1 and Schedule 2 hospitals use different tendering procedures

4.5 It can be seen from Table 7 above that Schedule 1 and Schedule 2 hospitals use different tendering procedures for the procurement of medical equipment. For example, when a Schedule 1 hospital needs to procure an equipment item costing more than $1 million, it has to conduct the procurement through the GSD Tender Board or the Central Tender Board. On the other hand, if a Schedule 2 hospital needs to procure the same item of equipment, it has to conduct the procurement through its Hospital Tender Board or Special Hospital Tender Board. According to the HA, Schedule 2 hospitals had not used the procurement and tendering services of the GSD before the HA took over their management in 1991.

4.6 **As all public hospitals are under the overall management of the HA and mainly use public funds for their operations, they should use similar tendering procedures to procure equipment so as to ensure consistency in procedures. Audit considers that the HA should take action to ensure that Schedule 1 and Schedule 2 hospitals adopt the same procurement procedures for medical equipment.**

Uncoordinated procurement of medical equipment among HA hospitals

4.7 It is stated in the administrative directions of the Procurement and Materials Management Manual of the HA that:

> *"Hospitals should consolidate their resources and expertise required for performing procurement functions, as far as practical, in order to ensure consistent performance standards and to contain procurement cost."*

4.8 However, Audit observes that it was rare for hospitals to consolidate their resources and expertise in the procurement of medical equipment. Most hospitals conducted their procurement of medical equipment individually without central coordination. Audit considers that these uncoordinated arrangements are undesirable. The following are some of the disadvantages of the uncoordinated arrangements:

(a) ***Higher administration costs involved in procurement.*** There are 44 HA hospitals and, under the existing arrangements, each hospital needs to set up a procurement section to perform the purchasing function. This will lead to duplication of efforts and waste of resources. It will be more cost-effective if HAHO forms a centralised procurement unit to handle all procurement of medical equipment of the 44 hospitals;

(b) ***Higher equipment costs due to lower bulk-purchase discounts.*** It is likely that hospitals which conduct procurement of medical equipment individually will obtain lower bulk-purchase discounts; and

(c) ***Proliferation of brands of equipment.*** For equipment items which provide similar functions, uncoordinated procurement by individual hospitals will result in proliferation of brands of equipment. This will lead to:

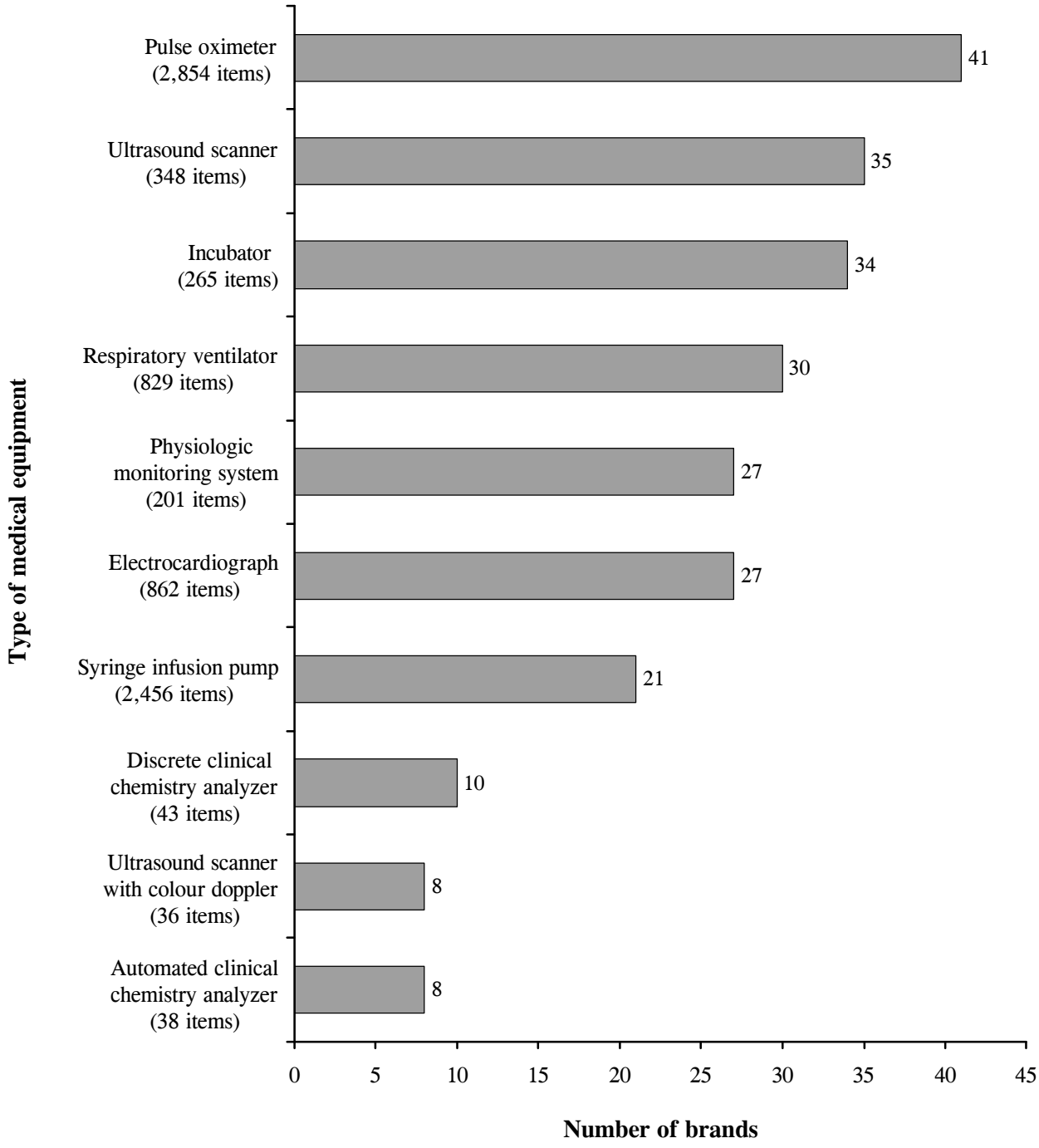
(i) ***Higher maintenance costs.*** More contractors will need to be found to provide maintenance services to different brands of medical equipment. Furthermore, more spare parts will be required, resulting in higher spare-part holding costs; and

(ii) ***Higher staff training costs.*** Different hospitals using different brands of equipment may lead to higher staff training costs when staff are transferred from one hospital to another.

4.9 ***Proliferation of brands of medical equipment.*** In order to ascertain the extent of proliferation of brands of equipment on similar medical equipment items acquired, Audit randomly selected ten types of medical equipment installed in HA hospitals and conducted an investigation into the number of different brands of such equipment. Figure 4 below shows the audit findings.

Figure 4

Number of brands of ten types of medical equipment installed in HA hospitals as at 31 March 2001



Source: HA's AMS records

4.10 **Audit considers that the HA should take action to consolidate the resources and expertise required for performing the procurement function of hospitals to form a central procurement unit in HAHO.** This will help ensure consistent performance standards and reduce procurement costs among hospitals. To avoid undue reliance on a small number of suppliers of medical equipment, which might lead to higher equipment costs and maintenance costs, periodic tender exercises should be conducted by HAHO centrally. This will also create more competition among the suppliers.

4.11 Audit noted that the GSD provided the HA with expert advice on tendering procedures. As the HA procures $540 million of medical equipment a year, it is desirable to explore other avenues of procurement, and to rely less on the services of the GSD. This will help improve the efficiency of the HA in the procurement of medical equipment. Furthermore, as suggested in a consultation document on "Review of Government Financial Reporting Policy" issued by the Government in April 2001, the GSD is one of the departments recommended for implementation of inter-departmental charging from 2002. By that time, the GSD may charge fees for the services provided to the HA. **Audit considers that it is an opportune time for the HA to consider continuing to use the GSD's services or using the HA's own procedures.**

Nominated Product Scheme

4.12 In 1996, the HA conducted a survey of purchasing practices in hospitals. The survey revealed that hospitals organised direct purchase of medical equipment individually. This resulted in hospitals acquiring different brands of medical equipment which provided similar functions.

4.13 In the light of the results of the survey, in April 1997 the HA introduced a pilot NPS for the procurement of some common medical equipment items. Under the pilot NPS, HAHO selected 19 types of commonly-used medical equipment with costs below $200,000 per item. HAHO conducted negotiations with some suppliers on a set of agreed prices for these 19 types of equipment. The agreed prices would be binding on the suppliers over an agreed period of time, during which hospitals could procure these 19 types of NPS equipment from the nominated suppliers at the agreed prices.

4.14 ***Limited advantages of the NPS.*** As HAHO could not guarantee the number of items of equipment which hospitals would buy from each supplier, the bulk-purchase discounts offered by the suppliers would be relatively limited under the NPS. Audit considers that, whilst the NPS to a certain extent would help reduce some procurement costs, secure some bulk-purchase discounts, and reduce the proliferation of brands of equipment acquired, the NPS would not achieve the benefits which would be expected from a scheme of centralised and coordinated procurement of medical equipment (see para. 4.10 above).

4.15 **When compared with central procurement, the NPS would only achieve limited cost savings and reduction in proliferation of brands of equipment. Audit considers that the HA should consider replacing the NPS by centralised procurement of medical equipment in HAHO.**

Audit recommendations on procurement of medical equipment

4.16 **Audit has *recommended* that the Chief Executive, HA should:**

(a) **conduct a review on the tendering procedures for the procurement of medical equipment with a view to formulating a common set of consistent and cost-effective procedures for use by all HA hospitals;**

(b) **consider forming a central procurement unit in HAHO to consolidate the resources and procurement expertise in hospitals;**

(c) **consider the option of using the HA's own tendering procedures, instead of using the services of the GSD;**

(d) **require all HA hospitals to forward their medical equipment procurement requirements to HAHO for consolidation into bulk procurement tenders; and**

(e) **conduct periodic tender exercises for the supply of common medical equipment for hospitals.**

Response from the Administration

4.17 The **Secretary for the Treasury** has said that the FB supports the recommendation for the HA to handle its own tenders without relying on the GSD.

Response from the HA

4.18 The **Chief Executive, HA** has said that the HA accepts the five recommendations stated in paragraph 4.16 above. He has also said that:

(a) the HA has commenced a review on the existing tendering procedures to eliminate inconsistencies between Schedule 1 and Schedule 2 hospitals;

(b) centralisation of procurement with due regard to bulk leverage will be enhanced through the development of clusters. Central coordination will be retained, where appropriate, at the corporate level to capitalise on the specialist skills captured by the respective COCs. Centralisation of procurement at the corporate level will only be implemented in areas where economies of scale and significant benefits can be achieved;

(c) in consultation with the Government on resource implications, the HA will consider the option of using its own tender resources instead of using the GSD's service; and

(d) the HA welcomes the recommendations stated in paragraph 4.16(d) and (e) above. The HA will introduce bulk procurement tenders for major medical equipment items to tie in with the replacement programmes. For instance, the HA is planning to conduct a bulk tender for replacement of linear accelerators in three hospitals in the next two years.

PART 5: AMS AND UTILISATION OF MEDICAL EQUIPMENT

5.1 This PART examines the management information system for medical equipment and the HA's monitoring of the utilisation of medical equipment.

Assets Management System

5.2 In 1996, after a pilot run of the AMS in two hospitals, the HA decided to implement the AMS in all HA hospitals by March 1999. The estimated cost of the AMS project was $15.4 million.

5.3 The AMS records information of all items of equipment costing $5,000 or more per item. It is an integrated system which links up the AMS of each HA hospital. HAHO can access the asset management information of all HA hospitals through the AMS.

5.4 The main information kept in the AMS includes the following:

(a) the particulars of an asset (including its brand name, model, cost, location, name of the supplier and acceptance test dates); and

(b) other management information, such as utilisation data of medical equipment items costing $1 million or more per item.

Audit observations on AMS and utilisation of medical equipment

QEH and BTS have not implemented the AMS

5.5 Up to 31 March 2001, all HA hospitals had implemented the AMS, except the QEH and BTS. In response to Audit's enquiries, in September 2001 HAHO informed Audit that:

(a) the QEH had installed its own AMS which operated with some hospital specific functions. The QEH would retain its own system but an interface with the HA's AMS would be provided. The target completion date was early 2002. By that time, the QEH's system would be linked up with the HA's AMS; and

(b) the BTS was in the process of implementing the AMS.

5.6 Audit considers that the AMS is an important medical equipment information system. The system provides essential information to HAHO when making decisions on acquisition of new or additional items of medical equipment, equipment maintenance and SOP. **Audit considers it unsatisfactory that, five years after the introduction of the AMS in 1996, the QEH and the BTS have not implemented the AMS. Audit considers that the HA should expedite actions to implement the AMS in the QEH and the BTS.**

Utilisation of medical equipment in established hospitals

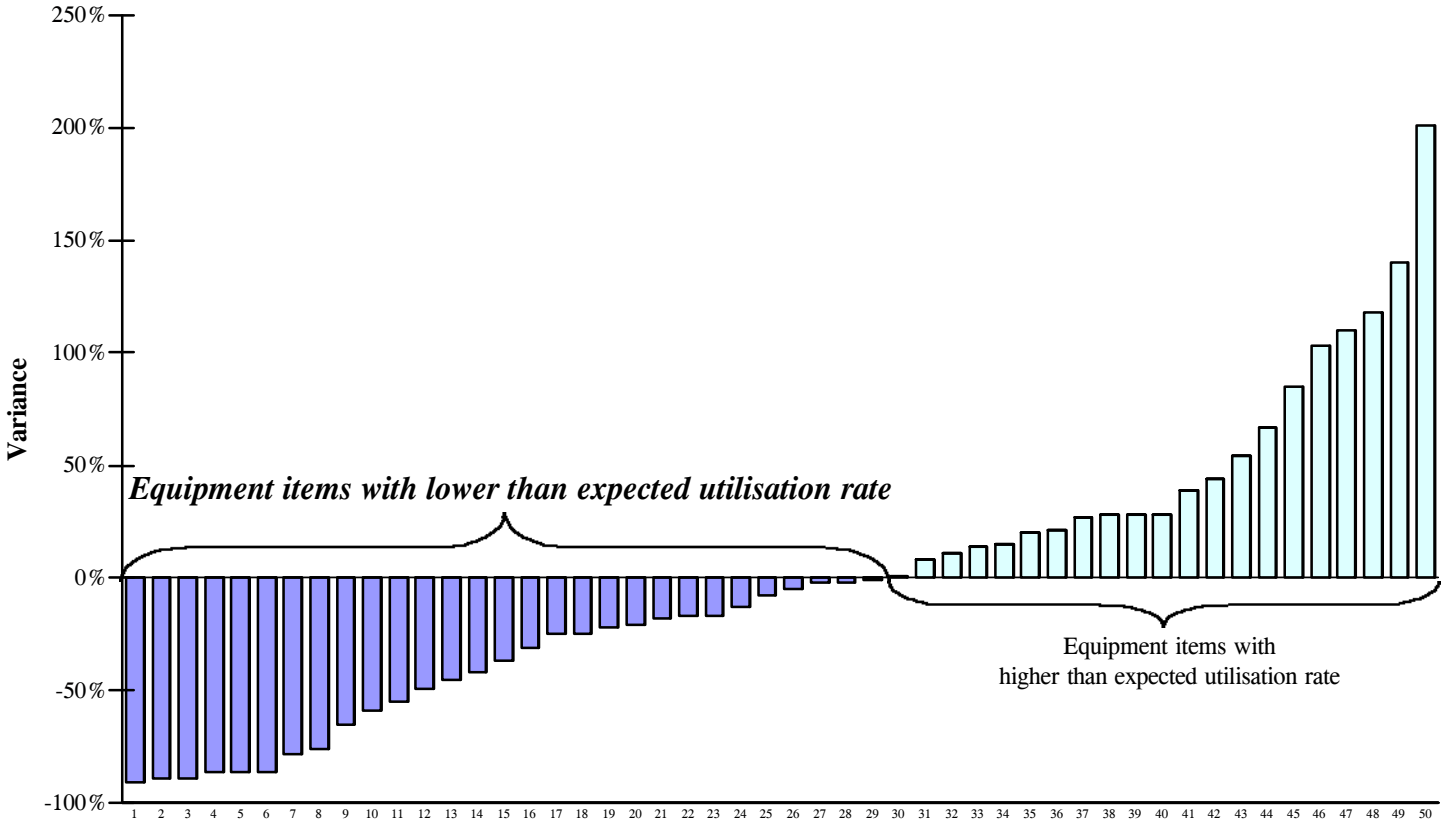
5.7 For the acquisition of new, additional or replacement items of medical equipment costing $1 million or more per item, HA hospitals are required to state in the procurement submissions to HAHO the expected utilisation of the equipment. Furthermore, hospitals are required to record the utilisation of medical equipment items costing $1 million or more per item in the AMS. As at 31 March 2001, the utilisation information of 685 items of medical equipment costing $1 million or more per item was input into the AMS. The total value of these items of equipment amounted to $2.1 billion, which was 41% of the estimated cost of $5.1 billion of all medical equipment items in the HA.

5.8 ***Audit examination.*** Audit randomly selected 50 items of major equipment (i.e. costing $1 million or more per item) which had been procured for use by established hospitals (Note 19) in the past three years. The names of the 50 items of medical equipment selected for examination are shown at Appendix E. Audit compared the actual utilisation of the equipment, as recorded in the AMS in 1999-2000 and 2000-01, with the expected utilisation stated in the equipment applications submitted to HAHO. The results of the comparisons are shown in Figure 5 below.

Note 19: *For this audit review purpose, established hospitals are hospitals which had commenced operations before 1996.*

Figure 5

Actual and expected utilisation of 50 items of major medical equipment in some established hospitals



Medical equipment
(For the equipment description and the hospitals, see Appendix E)

Source: *HA's AMS records*

Note: *The utilisation information was based on the data in the AMS in 1999-2000 and 2000-01. The variance between the actual utilisation and the expected utilisation was calculated using the following formula:*

[(Actual utilisation in 1999-2000 and 2000-01 ÷ 2) – Expected utilisation] ÷ Expected utilisation × 100%

The established hospitals are: CMC, GH, KH, KWH, PMH, PWH, PYNEH, QEH, QMH, RH, TMH, TWEH, TWH and YCH (see Appendix H for their full names).

5.9 Figure 5 above shows that, in 1999-2000 and 2000-01, of the 50 items of major equipment selected for examination, the actual utilisation of 29 items (58%) fell below the expected utilisation stated in the equipment applications submitted to HAHO. For eleven items, the actual utilisation was lower than the expected utilisation by more than 50%.

5.10 As the expected utilisation of a medical equipment item is one of the key factors for consideration in the annual resource allocation exercises for major equipment items (see para. 2.41 above), Audit considers that:

(a) hospitals should make efforts to ensure that the estimated utilisation is fairly stated having regard to, for example, the utilisation of similar equipment items already installed and future development plans; and

(b) HAHO should implement procedures for monitoring the utilisation of major medical equipment items and take action to prevent serious underutilisation. For example, HAHO could, based on the information captured in the AMS, produce exception reports on the utilisation of those major equipment items which have fallen significantly below the expected utilisation. Based on such exception reports, HAHO should:

(i) request the hospitals concerned to explain the variances;

(ii) remind the hospitals concerned that they should state the expected utilisation fairly and reasonably in the equipment applications; and

(iii) consider allocating the underutilised equipment items to other hospitals which have a need for such equipment.

Utilisation of medical equipment in new hospitals

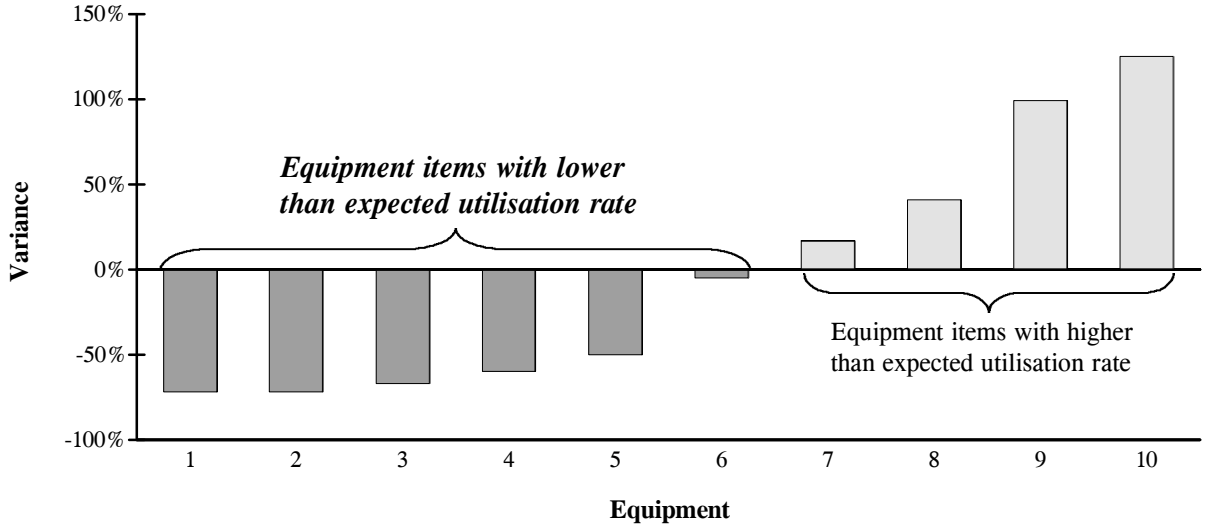
5.11 A new hospital requires a full range of medical equipment. Before procurement, the HA needs to submit applications to the HWB stating the justifications for the acquisition. Among other things, the expected utilisation of the equipment items must be stated in the applications submitted to the HWB. The HWB approves the acquisition of the equipment items if it is satisfied with the justifications provided by the HA. The HA procures such equipment items to tie in with the commissioning programme of the new hospital.

5.12 ***Audit examination.*** To assess the utilisation of medical equipment acquired in new hospital projects, Audit selected two recently built hospitals, namely AHNH and NDH, and randomly selected for review ten items of major medical equipment costing $1 million or more per item installed there. The names of the 20 items of medical equipment selected for examination are shown at Appendix F. Audit compared the actual utilisation of the equipment items in 1999-2000 and 2000-01 with the expected utilisation stated in the acquisition applications submitted to the HWB. The results of the examination are shown in Figure 6 below.

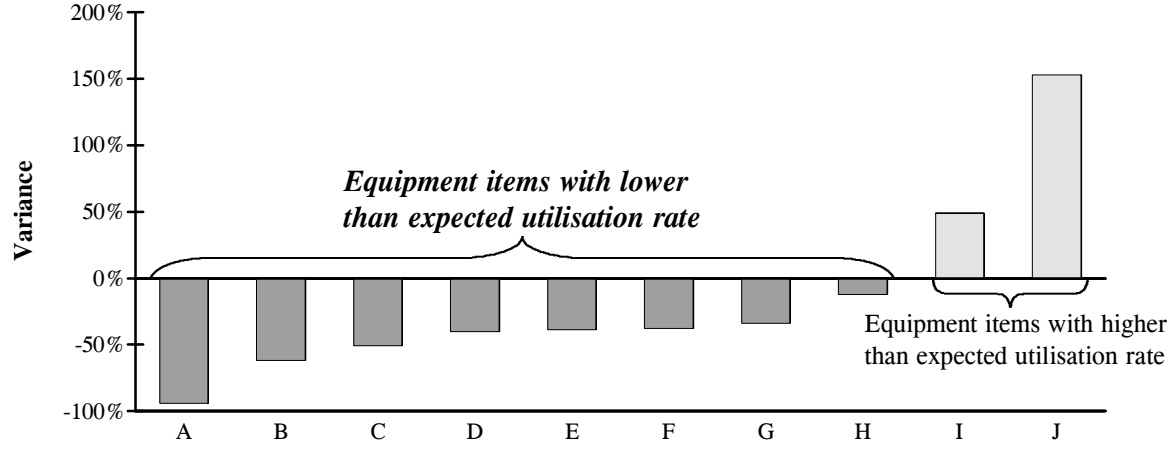
Figure 6

Actual and expected utilisation of 20 items of major medical equipment

(a) AHNH



(b) NDH



(For the equipment description, see Appendix F)

Source: *HA's AMS records*

Note: *The utilisation information for 1999-2000 and 2000-01 was obtained from the AMS. The variance between the actual utilisation and the expected utilisation was calculated using the following formula:*

[(Actual utilisation in 1999-2000 and 2000-01 ÷ 2) – Expected utilisation] ÷ Expected utilisation × 100%

5.13 The AHNH commenced operation in January 1997 and the NDH in February 1998. As shown in Figure 6 above, in the AHNH, the actual utilisation of four of the ten selected major medical equipment items was lower than the expected utilisation by more than 50%. Similar underutilisation was found for three of the ten selected major medical equipment items in the NDH. In particular, in the NDH the actual utilisation of a surgical laser fell below the expected utilisation by 94%.

5.14 Audit appreciates that it may take some time for the demand for the healthcare services of a new hospital to build up. The medical equipment may meanwhile be underutilised due to lack of patients, medical personnel, or both.

5.15 Audit notes that some essential medical equipment items need to be installed before a new hospital commences operation. Audit also notes that the HA acquires other medical equipment items by phases to tie in with the gradual build-up of demand for its services. **However, in view of the observations in paragraph 5.13 above, Audit considers that the HA should make improvements to the acquisition programme for medical equipment so that, in the new hospitals, the acquisition of equipment will dovetail with the build-up of demand for medical services.** Under such an acquisition programme, all basic essential medical equipment items are acquired and installed before a new hospital commences operation. For other equipment items, the procurement should be deferred to a time when the demand for the services has grown to a level which justifies the provision of the equipment for the new hospital. Meanwhile, consideration could be given to sharing such equipment items installed in other hospitals. This is one of the objectives of the cluster arrangements for hospitals (see para. 1.5 above).

5.16 The acquisition programme outlined in paragraph 5.15 above has the following advantages:

(a) it helps defer expenditure on expensive equipment items which are not immediately required;

(b) it reduces the recurrent maintenance expenditure on equipment items during the low utilisation period; and

(c) it minimises obsolescence of medical equipment items due to rapid advancement in medical technology.

Audit recommendations on AMS and utilisation of medical equipment

5.17 **Audit has *recommended* that the Chief Executive, HA should:**

(a) **expedite actions to implement the AMS in the QEH and the BTS;**

(b) **implement procedures to enable HAHO to monitor and improve the utilisation of major medical equipment installed in hospitals by:**

(i) **producing periodically exception reports on underutilised equipment items;**

(ii) **conducting investigations into the reasons for the underutilisation of such equipment; and**

(iii) **taking appropriate actions to improve the utilisation of such equipment, such as reallocating the equipment items to other hospitals; and**

(c) **for new hospitals, improve the medical equipment acquisition programme so that the acquisition of major medical equipment items dovetails with the build-up of demand for medical services.**

Response from the HA

5.18 The **Chief Executive, HA** has said that the HA accepts the recommendations stated in paragraph 5.17 above, and will take action to strengthen the controls and the good practices already in place.

PART 6: MAINTENANCE OF MEDICAL EQUIPMENT

6.1 This PART examines the different arrangements for the provision of maintenance services for medical equipment in Schedule 1 and Schedule 2 hospitals.

X-ray and non X-ray equipment

6.2 In a hospital setting, there is a wide variety of different types of medical equipment. For the purpose of PART 6 of this report, medical equipment items are classified into two types, namely X-ray equipment and non X-ray equipment. ***X-ray equipment*** includes radiotherapy equipment and other miscellaneous X-ray equipment. All other medical equipment items are referred to as ***non X-ray equipment.***

Preventive and corrective maintenance

6.3 In general, there are two kinds of maintenance services for medical equipment, namely preventive maintenance and corrective maintenance. ***Preventive maintenance*** is planned maintenance carried out on a periodical basis to correct defects or replace parts to ensure that the equipment will not break down. ***Corrective maintenance*** is unplanned maintenance which is carried out on a need basis when there is a breakdown of the equipment.

Maintenance of medical equipment in Schedule 1 and Schedule 2 hospitals

6.4 Arrangements for the provision of maintenance services for both X-ray and non X-ray equipment vary among hospitals. There are further variations between Schedule 1 and Schedule 2 hospitals, as follows:

— ***X-ray equipment.*** Schedule 1 hospitals use the services of both the Medical Physics Units (MPUs) and outside contractors, but Schedule 2 hospitals mainly employ outside contractors; and

— ***Non X-ray equipment.*** Services at Schedule 1 hospitals are mostly provided by the EMSTF. Schedule 2 hospitals use the services of both the EMSTF and outside contractors.

Table 8 below shows the maintenance costs of X-ray and non X-ray equipment in Schedule 1 and Schedule 2 hospitals.

Table 8

Maintenance costs of X-ray and non X-ray equipment in Schedule 1 and Schedule 2 hospitals in 2000-01

		X-ray equipment		Non X-ray equipment	
		Schedule 1 hospitals	**Schedule 2 hospitals**	**Schedule 1 hospitals**	**Schedule 2 hospitals**
		($ million)	**($ million)**	**($ million)**	**($ million)**
(a)	**Estimated cost of equipment as at 31 March 2001**	**1,246**	**374**	**2,273**	**1,223**
(b)	Estimated maintenance cost incurred by MPUs (for X-ray equipment)	30	–	–	–
(c)	Estimated maintenance cost incurred by EMSTF (for non X-ray equipment)	–	–	140	30
(d)	Estimated maintenance fees paid to contractors	53	27	5	39
(e)	**Total estimated maintenance cost (e)=(b)+(c)+(d)**	**83**	**27**	**145**	**69**
(f)	Maintenance cost expressed as a percentage of equipment cost (f)=(e)÷(a)×100%	6.7%	7.2%	6.4%	5.6%

Source: HA's records

Maintenance of X-ray equipment provided by MPUs

6.5 MPUs are established in six major Schedule 1 hospitals, namely QMH, PYNEH, PWH, QEH, TMH and NDH. The MPUs are responsible for maintenance, quality assurance, calibrations and acceptance testing of X-ray equipment installed in these hospitals, as well as the other nearby Schedule 1 hospitals.

Maintenance of non X-ray equipment provided by the Electrical and Mechanical Services Department

6.6 Before 1 August 1996, the Electrical and Mechanical Services Department (EMSD) was responsible for providing maintenance services to the HA. The provision of such services has been taken over by the EMSTF with effect from 1 August 1996. Under the trading fund arrangement, the EMSTF has to charge the HA for the services provided. Up to 31 July 1999, the HA was tied to using the services provided by the EMSTF. Financial Circular No. 9/99 of June 1999 issued by the FB stated that:

(a) with effect from 1 August 1999, user departments (including the HA) would be untied from the services provided by the EMSTF by four phases over a three-year period. From 1 August 2000 onwards, the HA would be untied from the services provided by the EMSTF;

(b) upon untying, the HA would be free either to retain the services of the EMSTF or to choose alternative service providers from the market to meet part or all of the HA's electrical and mechanical service needs; and

(c) the HA should take this opportunity to review their service requirements and plan ahead.

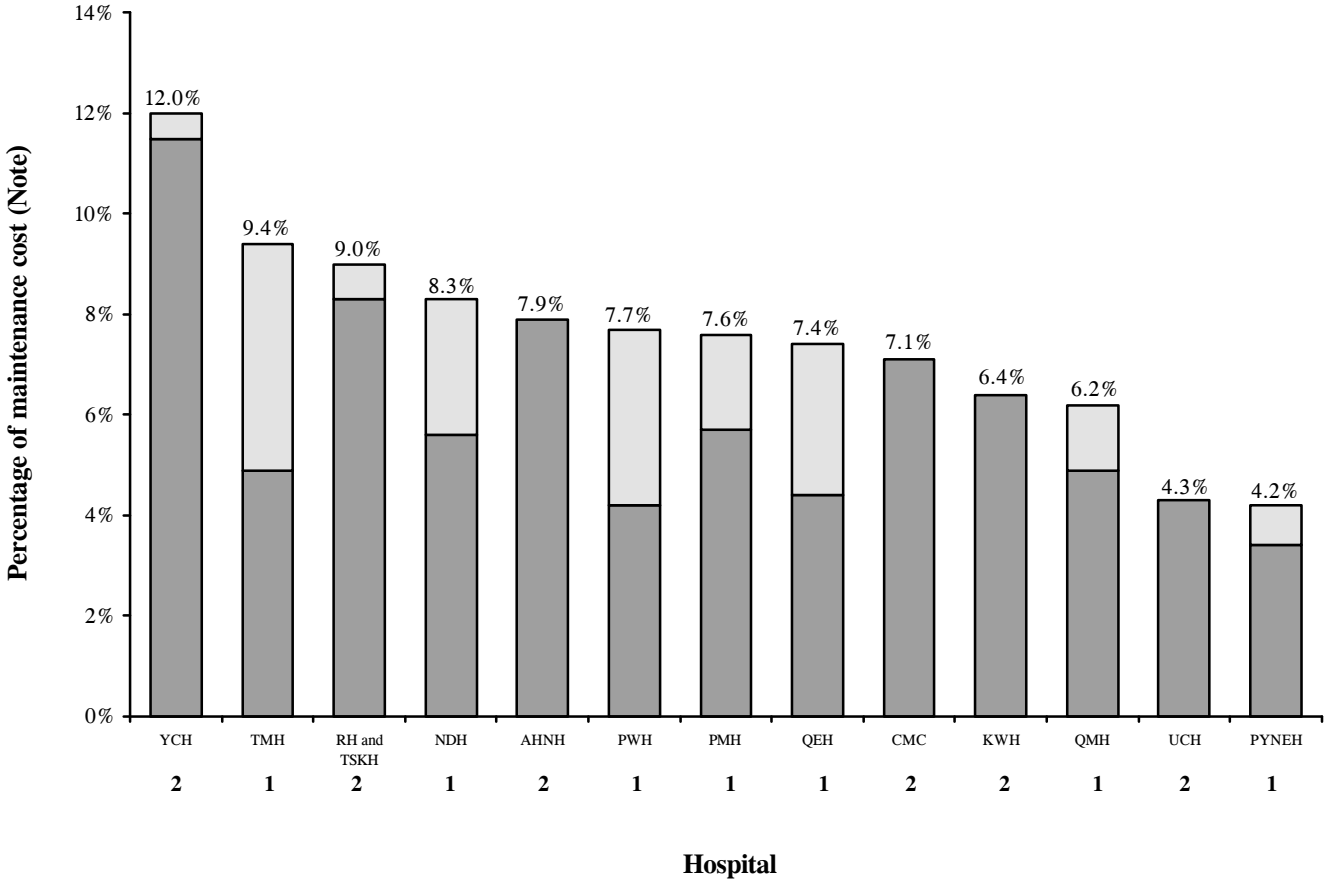
Audit observations on maintenance of medical equipment

Wide variations in maintenance costs among hospitals

6.7 Audit compared the maintenance costs of equipment items in 13 acute hospitals which provided accident and emergency services, of which seven are Schedule 1 hospitals and six are Schedule 2 hospitals. Due to the different maintenance arrangements for X-ray and non X-ray equipment, the maintenance costs of the two types of equipment are separately examined. The results of the comparisons are shown in Figure 7 and Figure 8 below.

Figure 7

X-ray equipment maintenance costs in 2000-01



Legend: 1 = Schedule 1 hospital

2 = Schedule 2 hospital

Percentage of maintenance cost of work carried out by MPU

Percentage of maintenance cost paid to contractors

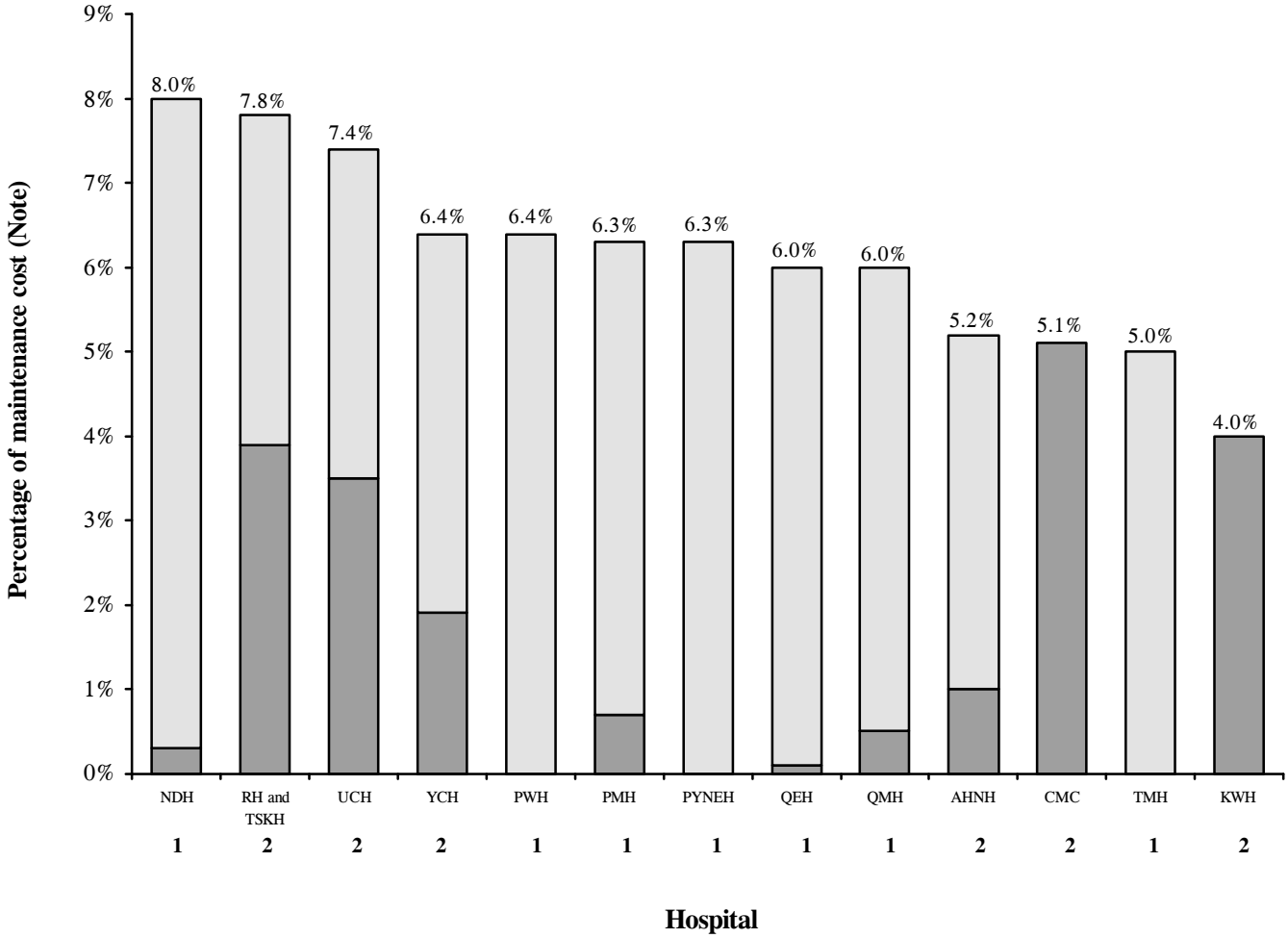
Source: *Data supplied by the HA at Audit's request*

Note: *The percentages are calculated using the following formula:*

(Maintenance cost in 2000-01 ÷ Cost of equipment as at 31.3.2001) × 100%

Figure 8

Non X-ray equipment maintenance costs in 2000-01



Legend: 1 = Schedule 1 hospital

2 = Schedule 2 hospital

Percentage of maintenance cost paid to EMSTF

Percentage of maintenance cost paid to contractors

Source: *Data supplied by the HA at Audit's request*

Note: *The percentages are calculated using the following formula:*
(Maintenance cost in 2000-01 ÷ Cost of equipment as at 31.3.2001) × 100%

6.8 It can be seen from Figures 7 and 8 above that there were significant variations in maintenance costs among different hospitals. For example, the percentage of maintenance cost of X-ray equipment (as a percentage of equipment cost) for the YCH was 12% whereas for the PYNEH it was only 4.2%. Regarding non X-ray equipment, the percentages for the NDH and KWH were 8% and 4% respectively.

6.9 **The variations in maintenance costs indicate that some hospitals might have adopted more cost-effective maintenance arrangements than others. To ensure that the most cost-effective maintenance arrangements are adopted by all HA hospitals, Audit considers that the HA should conduct a review to ascertain the reasons for the variations in maintenance costs. Thereafter, the HA should identify the most cost-effective arrangements and best practices and implement them in all HA hospitals.**

Schedule 1 and Schedule 2 hospitals use different service providers and maintenance approaches

6.10 ***Different service providers.*** **Audit considers it undesirable that Schedule 1 and Schedule 2 hospitals use different arrangements for the provision of maintenance services (see para. 6.4 above). As all public hospitals are under the management of the HA, the HA should choose the service providers who provide the most cost-effective maintenance services.**

6.11 In a recent tender exercise conducted by the HA for the maintenance of non X-ray equipment, it was revealed that the tender prices offered by outside contractors were generally lower than those offered by the EMSTF (see para. 6.32 below).

6.12 **Audit considers that the HA should conduct detailed comparisons of the costs of:**

(a) **maintenance services for X-ray equipment provided by the MPUs and by outside contractors; and**

(b) **maintenance services for non X-ray equipment provided by the EMSTF and by outside contractors.**

Based on the results of the cost comparisons, and taking into account the quality of the maintenance services, the HA should choose the service providers who provide the most cost-effective maintenance services.

6.13 ***Different maintenance approaches.*** Audit's enquiries reveal that, for non X-ray equipment in Schedule 1 hospitals, the EMSTF uses preventive maintenance procedures. On the other hand, most Schedule 2 hospitals use corrective maintenance procedures for non X-ray equipment. Due to the higher frequency of maintenance services, preventive maintenance is more costly than corrective maintenance.

6.14 In early 2000, the HA conducted a review on the maintenance of non X-ray equipment. As a result, the HA decided to adopt a risk approach for maintenance services. Based on the internationally recognised standard issued by the Emergency Care Research Institute, the HA decided to adopt the less costly ***corrective maintenance*** service mode for medium and low risk equipment items instead of ***preventive maintenance***. Of the estimated $159 million annual maintenance expenditure for non X-ray equipment at Schedule 1 hospitals at that time, the HA estimated that the new approach would lead to an annual saving of $10 million.

6.15 **Corrective maintenance, instead of preventive maintenance, would usually result in cost savings to the HA. It is desirable for the HA, based on internationally recognised risk assessment standards, to conduct a thorough review on all types of X-ray and non X-ray equipment to examine the costs and benefits of adopting either the preventive or corrective maintenance approach.**

HA hospitals awarded separate maintenance contracts to different contractors

6.16 In 2000-01, HAHO outsourced some of the maintenance services for X-ray equipment installed in Schedule 1 hospitals to outside contractors. In the same year, Schedule 2 hospitals paid $66 million to outside contractors for maintenance services for both X-ray and non X-ray equipment. Schedule 2 hospitals selected their own contractors for providing maintenance services, without the HA's central coordination. Audit considers that there is room for improvement in the maintenance contract arrangements.

6.17 In a review conducted by the HA in early 2000, it was found that the quality of maintenance services for non X-ray equipment provided by contractors varied among Schedule 2 hospitals because these hospitals set different specifications for maintenance services. This shows that some form of central coordination by HAHO on maintenance services is needed.

6.18 Central coordination of maintenance services has the following benefits:

(a) it avoids duplication of efforts for each hospital having to enter into separate maintenance contracts with different contractors; and

(b) it can lead to bulk-contract discounts. In a recent tender exercise, a contractor would offer additional discount to the HA if he was granted the maintenance of all the equipment items (see para. 6.30 below).

6.19 **In Audit's view, to achieve cost savings and obtain more cost-effective maintenance services, HAHO should consider taking action to consolidate the resources and expertise for granting and monitoring of maintenance contracts in hospitals and forming a central maintenance unit in HAHO. The unit would be responsible for conducting tender exercises for and monitoring of maintenance contracts for all HA hospitals.**

Keeping of maintenance information

6.20 ***Cost information on MPU services.*** MPUs have records of their maintenance work. However, HAHO has not maintained cost information (e.g. staff cost) on maintenance services provided by MPUs. **Audit considers that such information is useful for controlling resources, staff management and service evaluation. The information can be kept in the AMS.**

6.21 ***Cost information on EMSD services.*** In mid-2000, HAHO conducted a review on maintenance services provided by the EMSTF. HAHO was concerned that the EMSTF did not provide the HA with a detailed price structure for its maintenance services or the rates of charge for maintaining each item of equipment.

6.22 **In 2000-01, the HA paid $170 million to the EMSTF for the maintenance of non X-ray equipment in all HA hospitals. Without detailed cost information, the HA cannot assess whether the service fees charged by the EMSTF are competitive, when compared with the fees charged by outside contractors (e.g. contractors of Schedule 2 hospitals providing similar maintenance services).**

6.23 ***The need for keeping maintenance information.*** Both Schedule 1 and Schedule 2 hospitals have not systematically maintained records of maintenance work carried out by the EMSTF or outside contractors on their X-ray or non X-ray equipment. Audit considers that the lack of such information is undesirable. Maintenance information is necessary and useful for the following purposes:

(a) making decisions on equipment replacement;

(b) evaluating the cost-effectiveness of the maintenance work carried out;

(c) assessing the performance of different brands of equipment; and

(d) estimating the life-cycle cost of equipment.

6.24 **The HA needs to consider enhancing the existing AMS so that it captures all information on equipment maintenance. For each item of equipment, information which should be captured in the AMS should include:**

(a) **dates of maintenance work;**

(b) **reasons for equipment breakdown;**

(c) **time and duration of equipment breakdown;**

(d) **parts changed; and**

(e) **maintenance work carried out.**

HA's recent pilot scheme on contracting out some maintenance services

6.25 In mid-2000, the HA conducted a review on maintenance services for non X-ray equipment. Upon completion of the review, the HA has decided that it would:

(a) continue to use the EMSTF to provide maintenance services for high-risk non X-ray equipment in Schedule 1 hospitals;

(b) subject to negotiations with the EMSTF, use the EMSTF for providing maintenance services for high-risk non X-ray equipment in Schedule 2 hospitals;

(c) introduce an open-tender system for maintenance of medium or low-risk non X-ray equipment over a five-year period; and

(d) launch a pilot project to invite contractors through an open tender to provide maintenance services for 18 types of selected non X-ray equipment.

6.26 In August 2000, the HA selected 18 types of low-risk or medium-risk non X-ray equipment (Note 20), which totalled 6,000 items, for the pilot project on contracting out of maintenance services. The HA estimated that the annual labour cost charged by the EMSTF for providing maintenance services to these 6,000 items of equipment was $8 million (Note 21), i.e. about 3.7% of the total maintenance cost of $214 million for non X-ray equipment in 2000-01 (see Table 8 in para. 6.4 above).

Note 20: *The classification was based on the criteria issued by the Emergency Care Research Institute. According to the criteria, any failure on misuse of the low-risk or medium-risk equipment items is unlikely to result in serious consequences or cause direct serious injury to patients.*

Note 21: *The actual charges for the 6,000 items of equipment were not provided by the EMSTF (see para. 6.21 above).*

6.27 To ensure that the services provided by contractors are comparable to the services provided by the EMSTF, the HA has specified the following terms in the maintenance contracts:

(a) frequency of preventive maintenance for each item of equipment;

(b) response time for service calls for corrective maintenance;

(c) service records; and

(d) maximum downtime.

6.28 Furthermore, contractors were required to provide in their tenders details of the qualifications and experience of their engineers who would be responsible for providing the maintenance services. After granting the maintenance contracts, the engineers of HAHO would carry out periodic inspections of the contractors' maintenance work. HAHO would also ask hospitals to provide evaluations on the maintenance services provided by the contractors.

6.29 In November 2000, the HA invited tenders for the maintenance of the 18 types of medical equipment. In response, five tenderers submitted offers, including the EMSTF. The Assessment Panel rejected one tender because of late submission of tender, and two other tenders because the tenderers failed to meet the mandatory requirements on technical capability. The remaining two tenderers were the EMSTF and a private company (hereinafter referred to as Company A).

6.30 The contract prices quoted by the EMSTF and Company A were as follows:

EMSTF:	$10.11 million per year (a 10% discount would be offered if a contract which included all 18 types of equipment was awarded to the EMSTF, i.e. the cost would be $9.1 million a year).
Company A:	$8.97 million per year (later reduced to $7.8 million).

6.31 The EMSTF and Company A both passed the tender requirements for technical capability. As the price quoted by Company A was lower, in March 2001, the HA granted the maintenance contract for all the 18 types of equipment to Company A at an annual fee of $7.8 million for a period of three years. The contract may be extended by another two years on the same terms and conditions.

6.32 After taking into account the discounts offered by the EMSTF and Company A (see para. 6.30 above), the total maintenance fee charged by Company A was $1.3 million ($9.1 million – $7.8 million), or 14.3% less than that quoted by the EMSTF. The maintenance fees quoted by the EMSTF and Company A on the 18 types of equipment are shown at Appendix G.

6.33 ***Potential cost saving if a flexible approach had been adopted in the tender exercise.*** A detailed examination of the fees quoted by the EMSTF and Company A for the 18 types of equipment has revealed that the total fee for the 18 types of equipment quoted by Company A was lower than that quoted by the EMSTF. However, for 10 types of equipment the EMSTF's maintenance fees quoted were actually lower than those quoted by Company A. Under the tender conditions, the HA had the right to either grant a maintenance contract to cover all the 18 types of equipment to one contractor, or grant separate contracts to more than one contractor for different types of equipment.

6.34 Audit estimated that, if the HA had granted a maintenance contract to the EMSTF for the ten types of equipment for which the EMSTF had quoted lower fees, and granted another contract to Company A to cover the remaining 8 types of equipment, the total annual maintenance cost for the 18 types of equipment would have been $6.6 million (Note 22). This represents an annual saving of $1.2 million ($7.8 million – $6.6 million).

6.35 **Because the HA considered that the EMSTF and Company A were both technically capable of providing the required maintenance services, the HA could have adopted a more flexible approach to grant separate maintenance contracts to the EMSTF and Company A. This would have saved the HA $1.2 million a year.**

6.36 In response to Audit's observations above, in September 2001 the HA said that:

(a) in the context of the maintenance contract awarded to Company A, it would be premature to assume that the EMSTF and Company A could provide maintenance services of similar quality without an impartial evaluation of end-users' satisfaction and the actual performance against the relevant quality indicators for similar types of medical equipment; and

(b) the assessment panel, in its evaluation of the technical proposals submitted by the EMSTF and Company A, had taken into account the need for providing a one-stop service for approximately 6,000 pieces of medical equipment located in 35 hospitals.

Note 22: *Because both the EMSTF and Company A might not be willing to offer discounts to the HA if they were only awarded contracts for part of the 18 types of equipment, their fees before the discounts were used for this estimation.*

6.37 ***Potential savings if the maintenance services for all non X-ray equipment are subject to competitive tender.*** As shown in Table 8 in paragraph 6.4 above, in 2000-01, the EMSTF charged a total of $170 million for the maintenance services for non X-ray equipment. According to the recent tender exercise, the price quoted by the successful tenderer was 14.3% (see para. 6.32 above) lower than that quoted by the EMSTF. On this basis, substantial cost savings could be achieved (Note 23) if the prices of all the maintenance services for non X-ray equipment are obtained through open tenders.

6.38 As stated in paragraph 6.25 above, the HA has decided to continue to use the EMSTF for maintenance of high-risk non X-ray equipment in Schedule 1 hospitals and Schedule 2 hospitals. **Audit considers that the HA should adopt open tenders for the maintenance of all types of non X-ray equipment in both Schedule 1 and Schedule 2 hospitals. This could result in substantial savings. Service providers in the private sector and the EMSTF can be invited to bid for the maintenance contracts. This will help ensure that the HA will obtain more cost-effective maintenance services.**

6.39 In response to Audit's observations, in September 2001 the **Director of Electrical and Mechanical Services** said that:

(a) based on the small-scale pilot tender exercise (see paras. 6.29 and 6.30 above), it was premature to project that savings could be gained by granting maintenance contracts to outside companies. The actual outcomes, extra resources required, and quality of maintenance services needed to be taken into account in future reviews on this issue;

(b) the EMSTF had committed to the HA it would further reduce the EMSTF's charges by 10% in the three-year period from 2001-02;

(c) the EMSTF supported the risk management approach in providing maintenance services. The EMSTF had included this approach in the service level agreements submitted to the HA; and

(d) the EMSTF had provided some charging information to the HA. However, it was impractical to provide the rate of charge for each of the tens of thousands of items of equipment.

Note 23: *This is based on the assumption that the fees quoted by the EMSTF in the recent tender exercise can reflect its maintenance costs of the other non X-ray equipment.*

Audit recommendations on maintenance of medical equipment

6.40 **Audit has *recommended* that the Chief Executive, HA should:**

(a) **conduct a review to ascertain the reasons for the variations in maintenance costs of medical equipment among hospitals with a view to adopting more cost-effective arrangements for all HA hospitals;**

(b) **establish a centralised unit in HAHO or in each cluster of hospitals to coordinate the granting and monitoring of maintenance contracts for X-ray and non X-ray equipment for all HA hospitals;**

(c) **based on internationally recognised risk assessment standards, conduct a thorough review on all types of medical equipment with a view to classifying them into high, medium or low risk equipment;**

(d) **based on the results of the risk assessments, adopt a consistent set of preventive maintenance procedures for all high-risk equipment items, and a consistent set of corrective maintenance procedures for medium-risk or low-risk items in all HA hospitals;**

(e) **implement a management information system in HAHO or in each cluster of hospitals to record the resources used by MPUs on maintenance services;**

(f) **based on the resources used by the MPUs on the maintenance of X-ray equipment in Schedule 1 hospitals, carry out a review to ascertain whether it is more cost-effective to outsource the maintenance services;**

(g) **adopt open tenders to increase competition for the provision of maintenance services from the EMSTF and the private sector for medical equipment in Schedule 1 and Schedule 2 hospitals; and**

(h) **enhance the AMS so that it captures all essential management information on equipment maintenance.**

Response from the HA

6.41 The **Chief Executive, HA** has said that the HA accepts the audit recommendations stated in paragraph 6.40 above. The HA will take the following actions in due course:

(a) the HA will review the variations in the maintenance costs of medical equipment among hospitals, and adopt the most cost-effective arrangements;

(b) the HA has already centrally coordinated a large portion of existing X-ray maintenance contracts. The HA will extend the practice to all hospitals;

(c) the HA has conducted a small scale review on risk assessment on medical equipment. The HA will continue to conduct regular reviews to improve the quality and risk management of medical equipment and maintenance;

(d) the HA will implement an enhanced maintenance module in the existing AMS to record the resources used by different providers of maintenance services including outside contractors, the EMSTF and the MPU. The HA will adopt the most cost-effective method of maintenance on medical equipment;

(e) in view of the vast amount of medical equipment items involved and its associated risks, the HA will proceed in phases and within a reasonable time span to introduce full scale implementation of open tenders for maintenance services for medical equipment; and

(f) the HA will proceed to enhance the AMS to capture all essential management information on equipment maintenance upon the implementation of the AMS maintenance module in 2002.

PART 7: HA'S OVERALL MANAGEMENT OF MEDICAL EQUIPMENT

7.1 This PART examines the role of the HA in managing the vast amount of medical equipment installed in the 44 HA hospitals from the strategic and corporate perspective.

Audit observations on HA's overall management of medical equipment

7.2 It can be seen from PART 2 to PART 6 above that the HA's management of medical equipment lacks a coherent strategy. The major findings of this audit review are as follows:

(a) the process of the annual resource allocation exercises for major medical equipment needs to be improved so as to reduce the HA's administrative work (see paras. 2.41 to 2.49 above);

(b) there were significant shortfalls in some types, and surpluses in other types, of medical equipment in some hospitals according to the HA's approved SOPs (see paras. 3.2 to 3.10 above);

(c) Schedule 1 and Schedule 2 hospitals have different arrangements for the procurement of medical equipment. They may procure medical equipment individually without the HA's central coordination, which has resulted in proliferation of brands of medical equipment among the hospitals (see paras. 4.5 to 4.18 above);

(d) the HA has not exercised adequate monitoring of utilisation of medical equipment in hospitals. Some medical equipment items are underutilised (see paras. 5.7 to 5.18 above); and

(e) Schedule 1 and Schedule 2 hospitals adopt different maintenance approaches. These hospitals sometimes award and manage maintenance contracts individually without the HA's central coordination. There are significant differences in maintenance costs among hospitals (see paras. 6.7 to 6.41 above).

The need for a management strategy of medical equipment

7.3 The cost of the medical equipment under the management of the HA amounts to $5.1 billion. The HA spends $540 million on procuring new medical equipment and $324 million on maintenance every year. In order to ensure that such substantial public resources are efficiently

and effectively managed and utilised, Audit considers that the HA should, following good practices, formulate a management strategy of medical equipment. The strategy should set out the policies and directions of the HA on the various issues on equipment management which should be in alignment with the HA's objectives on healthcare. The strategy should also address the issues identified in this audit report, which include the basis of provision of medical equipment, centralised procurement and maintenance of medical equipment, monitoring of utilisation of equipment, and removal of the differences between Schedule 1 and Schedule 2 hospitals on procurement and maintenance of medical equipment.

7.4 Audit believes that implementation of the recommendations contained in this audit report will lead to improvements to the management of medical equipment of the HA, bring about savings in the procurement and maintenance of medical equipment, and lead to further improvements to the delivery of public hospital services in Hong Kong.

Audit recommendations on HA's overall management of medical equipment

7.5 **In order to ensure that the substantial resources spent on medical equipment are being managed efficiently and effectively, Audit has *recommended* that the Chief Executive, HA should:**

(a) **formulate a strategy for the overall management of medical equipment and, in doing so, take into account the issues identified in this report, and the best practices elsewhere on the management of medical equipment; and**

(b) **set milestones and take action to closely monitor the progress of implementation of the strategy.**

Response from the HA

7.6 The **Chief Executive, HA** has said that the HA accepts the two recommendations stated in paragraph 7.5 above, and will take appropriate action in due course.

Cluster administration of Schedule 1 and Schedule 2 hospitals as at 31 March 2001

Cluster	Schedule 1 hospital		Schedule 2 hospital	
	Name	**No. of beds**	**Name**	**No. of beds**
Hong Kong East (Total no. of beds: 3,258)	Pamela Youde Nethersole Eastern Hospital (PYNEH)	1,735	Cheshire Home, Chung Hom Kok (CCH)	240
	Tang Shiu Kin Hospital (TSKH)	88	Ruttonjee Hospital (RH)	599
	St. John Hospital (SJH)	93	Tung Wah Eastern Hospital (TWEH)	303
	Wong Chuk Hang Hospital (WCHH)	200		
Hong Kong West (Total no. of beds: 2,982)	Tsan Yuk Hospital (TYH)	199	Duchess of Kent Children's Hospital at Sandy Bay (DKCH)	130
	Queen Mary Hospital (QMH)	1,440	Tung Wah Group of Hospitals Fung Yiu King Hospital (FYKH)	296
			MacLehose Medical Rehabilitation Centre (MMRC)	130
			Tung Wah Hospital (TWH)	787
Kowloon Central (Total no. of beds: 3,329)	Kowloon Hospital (KH)	1,123	Hong Kong Buddhist Hospital (BH)	356
	Queen Elizabeth Hospital (QEH)	1,850		
Kowloon West (Total no. of beds: 2,692)			Kwong Wah Hospital (KWH)	1,428
			Our Lady of Maryknoll Hospital (OLMH)	258
			Tung Wah Group of Hospitals Wong Tai Sin Hospital (WTSH)	1,006
Kowloon East (Total no. of beds: 1,999)	Tseung Kwan O Hospital (TKOH)	388	Haven of Hope Hospital (HHH)	437
			United Christian Hospital (UCH)	1,174

Cluster	Schedule 1 hospital		Schedule 2 hospital	
	Name	**No. of beds**	**Name**	**No. of beds**
New Territories East (Total no. of beds: 3,782)	Prince of Wales Hospital (PWH)	1,364	Alice Ho Miu Ling Nethersole Hospital (AHNH)	555
	Shatin Hospital (SH)	640		
	Tai Po Hospital (TPH)	901	Bradbury Hospice (BBH)	26
			Cheshire Home, Shatin (SCH)	296
New Territories North (Total no. of beds: 4,780)	Castle Peak Hospital (CPH)	1,691	Pok Oi Hospital (POH)	404
	Fanling Hospital (FH)	(Note)		
	Siu Lam Hospital (SLH)	300		
	Tuen Mun Hospital (TMH)	1,709		
	North District Hospital (NDH)	676		
New Territories South (Total no. of beds: 5,665)	Lai Chi Kok Hospital (LCKH)	424	Caritas Medical Centre (CMC)	1,396
	Kwai Chung Hospital (KCH)	1,572	Yan Chai Hospital (YCH)	873
	Princess Margaret Hospital (PMH)	1,400		
Non-cluster Hospitals / Institutions (Total no. of beds: 843)	Hong Kong Eye Hospital (HKEH)	64	Grantham Hospital (GH)	579
			Nam Long Hospital (NLH)	200
			Hong Kong Red Cross Blood Transfusion Service (BTS)	N/A
			Rehabaid Centre (RC)	N/A
Total no. of beds: 29,330		**17,857**		**11,473**

Source: HA's records

Note: The HA has planned to close the FH. As at 31 March 2001, the HA had phased out all the in-patient services of the FH.

Appendix B
(para. 2.20 refers)

Planned scope of services of the AHNH, NDH and TKOH projects as stated in the relevant FC papers

	AHNH	NDH	TKOH
(a) Number of in-patient beds			
Medical	106	96	132
Surgical	106	96	–
Surgical/Gynaecological	–	–	110
Mixed (medical/surgical)	–	64	–
Orthopaedics and Traumatology	93	96	64
Geriatric/Rehabilitation	93	–	–
Paediatrics	68	64	52
Obstetrics	62	64	52
Psychiatry	34	34	–
Intensive/Coronary Care	8	12	8
Gynaecological	42	32	–
Special Care Baby/Neonatal Intensive Care	–	32	26
Accident and Emergency Observation	30	–	14
Others	–	28	–
Total	**642**	**618**	**458**
(b) Ambulatory care			
(i) Number of day beds in Day Procedure Centre	**–**	**40**	**–**
(ii) Number of places in Day Hospital			
Surgical	20	–	20
Orthopaedics and Traumatology	40	–	–
Geriatric/Rehabilitation	40	40	40
Psychiatry	50	40	40
General Investigation/Treatment	20	–	–
Endoscopy	10	–	–
Obstetrics	–	–	15
Multi-purpose Day Ward	–	–	25
Total	**180**	**80**	**140**
(iii) 24-hour Accident and Emergency Service	Yes	Yes	Yes
(iv) Specialist Out-patient Clinic	Yes	Yes	Yes

Source: FC papers — FCR(93-94)12, FCR(93-94)91 and FCR(95-96)48

Appendix C
(para. 2.50 refers)

Allocation of resources for minor medical equipment in 2001-02

Hospital ref. no. in Figure 2	Hospital	Amount allocated in 2001-02 ($'000)	Hospital ref. no. in Figure 2	Hospital	Amount allocated in 2001-02 ($'000)
1.	TKOH	– (Note 1)	22.	BTS	300
2.	TPH	– (Note 1)	23.	WTSH	500
3.	LCKH	–	24.	TYH	500
4.	RC	100	25.	TWH	500
5.	WCHH	110	26.	SH	500
6.	SLH	110	27.	OLMH	500
7.	SJH	110	28.	BH	500
8.	FYKH	110	29.	AHNH	500
9.	CCH	110	30.	KH	610
10.	BBH	110	31.	GH	1,500
11.	SCH	160	32.	RH/TSKH	2,000 (Note 2)
12.	KCH	160	33.	YCH	2,400
13.	HKEH	170	34.	UCH	4,000
14.	CPH	170	35.	TMH	4,000
15.	POH	200	36.	QMH	4,000
16.	MMRC	230	37.	QEH	4,000
17.	HHH	230	38.	PYNEH	4,000
18.	TWEH	300	39.	PWH	4,000
19.	NLH	300	40.	PMH	4,000
20.	NDH/FH	300 (Note 2)	41.	KWH	4,000
21.	DKCH	300	42.	CMC	4,000

Source: HA's records

Note 1: TPH and TKOH commenced operation in 1998 and 1999 respectively. No funds were allocated to these two new hospitals for purchasing minor medical equipment.

Note 2: The NDH and FH were considered one hospital unit for the purpose of allocation of funds for minor medical equipment. The same arrangement applied for RH and TSKH. Therefore, there were 42 (44 – 2) hospital units for allocation of funds for minor medical equipment.

Audit's analysis of the application of SOP for eleven types of medical equipment in four selected hospitals as at 29 February 2000

SOP reference	Description	PYNEH				TMH			
		Total no. of items as per AMS	Total no. of items according to SOP	Surplus/ (shortfall)	Percentage of surplus/ (shortfall)	Total no. of items as per AMS	Total no. of items according to SOP	Surplus/ (shortfall)	Percentage of surplus/ (shortfall)
		(a)	(b)	(c) = (a) - (b)	(d) = (c) ¸ (b) ´ 100%	(a)	(b)	(c) = (a) - (b)	(d) = (c) ¸ (b) ´ 100%
SP1	Ventilator	123	101	22	22%	153	108	45	42%
SP2	Infusion pump	685	562	123	22%	523	644	(121)	(19%)
SP3	Defibrillator/ Monitor/ Pacemaker	64	61	3	5%	92	59	33	56%
SP4	Pulse oximeter	168	308	(140)	(45%)	165	388	(223)	(57%)
SP5	Physiological monitor	241	259	(18)	(7%)	197	307	(110)	(36%)
SP6	Blood pressure monitor, non-invasive	164	171	(7)	(4%)	150	207	(57)	(28%)
SP7	Blood glucose monitor	44	146	(102)	(70%)	(Note)	228	N/A	N/A
SP8	CO_2 monitor transcutaneous	14	37	(23)	(62%)	11	74	(63)	(85%)
SP9	Fetal monitor	22	19	3	16%	37	25	12	48%
SP10	Endoscopic equipment	59	125	(66)	(53%)	50	122	(72)	(59%)
SP11	Infant incubator	62	56	6	11%	62	68	(6)	(9%)

		UCH				CMC			
SOP reference	**Description**	**Total no. of items as per AMS**	**Total no. of items according to SOP**	**Surplus/ (shortfall)**	**Percentage of surplus/ (shortfall)**	**Total no. of items as per AMS**	**Total no. of items according to SOP**	**Surplus/ (shortfall)**	**Percentage of surplus/ (shortfall)**
		(a)	**(b)**	**(c) = (a) - (b)**	**(d) = (c) ¸ (b) ´ 100%**	**(a)**	**(b)**	**(c) = (a) - (b)**	**(d) = (c) ¸ (b) ´ 100%**
SP1	Ventilator	98	95	3	3%	49	60	(11)	(18%)
SP2	Infusion pump	556	609	(53)	(9%)	189	310	(121)	(39%)
SP3	Defibrillator/ Monitor/ Pacemaker	53	51	2	4%	35	37	(2)	(5%)
SP4	Pulse oximeter	175	357	(182)	(51%)	93	243	(150)	(62%)
SP5	Physiological monitor	237	296	(59)	(20%)	64	177	(113)	(64%)
SP6	Blood pressure monitor, non-invasive	101	208	(107)	(51%)	56	158	(102)	(65%)
SP7	Blood glucose monitor	(Note)	190	N/A	N/A	159	182	(23)	(13%)
SP8	CO_2 monitor transcutaneous	5	63	(58)	(92%)	(Note)	19	N/A	N/A
SP9	Fetal monitor	37	38	(1)	(3%)	15	4	11	275%
SP10	Endoscopic equipment	63	82	(19)	(23%)	24	55	(31)	(56%)
SP11	Infant incubator	50	55	(5)	(9%)	8	5	3	60%

Source: HA's AMS records

Note: Some hospitals did not maintain records on equipment items costing below $5,000 per item. Therefore, the percentages of surplus or shortfall of SP7 and SP8 could not be determined for some hospitals.

Appendix E
(para. 5.8 refers)

50 major equipment items in established hospitals

Equipment ref. no. in Figure 5	Hospital	Equipment description (Note)
1.	RH	Microbiological system, automated
2.	GH	Computed radiography system
3.	PMH	Laser, surgical, holmium
4.	QEH	Scanner, ultrasound, endoscopic
5.	CMC	Rehabilitation system, isokinetic, computerised
6.	QEH	Scanner, ultrasound
7.	CMC	Scanner, ultrasound, endoscopic
8.	PMH	Radiographic/Fluoro unit, mobile
9.	TMH	Scanner, ultrasound
10.	PMH	Laser, surgical, carbon dioxide
11.	TWEH	Radiographic unit, tomographic
12.	CMC	Laser, surgical, neodymium/yttrium aluminium garnet
13.	QEH	Scanner, ultrasound, with colour doppler
14.	RH	Analyzer, clinical chemistry, automated
15.	QMH	Radiographic unit, general
16.	CMC	Radiographic unit, mobile
17.	QEH	Microscope, operating
18.	GH	Heart lung bypass unit
19.	PMH	Camera, gamma
20.	TMH	Analyzer, blood culture
21.	QMH	Analyzer, clinical chemistry, automated
22.	KH	Radiographic unit, general
23.	CMC	Scanner, ultrasound, with colour doppler
24.	YCH	Analyzer, immunoassay, enzyme
25.	TMH	Camera, gamma
26.	QEH	Radiographic unit, general
27.	KWH	Radiographic unit, tomographic
28.	PWH	Analyzer, blood culture
29.	TWH	Radiographic unit, general
30.	KWH	Radiographic unit, general
31.	TMH	Counter, cell, differential
32.	KWH	Analyzer, blood culture
33.	TWH	Scanner, ultrasound
34.	TMH	Scanner, ultrasound, with colour doppler
35.	TWH	Cassette loader, daylight
36.	CMC	Scanner, ultrasound, with colour doppler
37.	PWH	Scanner, ultrasound, with colour doppler
38.	TMH	Linear accelerator, photon and electron
39.	PWH	Linear accelerator, photon
40.	KWH	Scanner, ultrasound, with colour doppler
41.	PWH	Aspirator, ultrasonic
42.	TMH	Analyzer, clinical chemistry, automated
43.	QEH	Scanner, ultrasound, with colour doppler
44.	YCH	Analyzer, clinical chemistry, discrete
45.	KWH	Radiographic/Fluoro unit, angiographic
46.	TMH	Scanner, computed tomography
47.	PYNEH	Scanner, ultrasound, with colour doppler
48.	QMH	Scanner, ultrasound
49.	TWH	Radiographic/Fluoro unit, mobile
50.	PWH	Radiographic/Fluoro unit, mobile

Source: HA's AMS records

Note: The description of the medical equipment items was extracted from the HA's AMS.

Appendix F
(para. 5.12 refers)

10 major equipment items in the AHNH and the NDH

Equipment ref. in Figure 6	Equipment description (Note)
(a) AHNH	
1.	Analyzer, clinical chemistry, automated
2.	Analyzer, clinical chemistry, automated
3.	Scanner, ultrasound
4.	Radiographic/Fluoro unit
5.	Radiographic/Fluoro unit
6.	Radiographic unit, general
7.	Radiographic unit, general
8.	Scanner, ultrasound
9.	Scanner, ultrasound, cardiac
10.	Scanner, computed tomography
(b) NDH	
A.	Laser, surgical, neodymium/yttrium aluminium garnet
B.	Scanner, ultrasound
C.	Analyzer, haematology
D.	Laboratory automation system
E.	Analyzer, clinical chemistry, discrete
F.	Radiographic/Fluoro unit, mobile
G.	Analyzer, blood culture
H.	Radiographic/Fluoro unit, mobile
I.	Computed radiography system
J.	Scanner, ultrasound

Source: HA's AMS records

Note: The description of the medical equipment items was extracted from the HA's AMS.

Appendix G
(para. 6.32 refers)

Maintenance fees quoted by the EMSTF and Company A for 18 types of non X-ray equipment

Item	Equipment description	No. of items	Estimated equipment cost	Annual maintenance fee quoted by the EMSTF (Note)	Annual maintenance fee quoted by Company A (Note)	Difference between annual fee quoted by the EMSTF and Company A
				(a)	(b)	(c) = (a) - (b)
			($)	($)	($)	($)
1.	Aspirator, high suction	449	3,211,248	187,502	169,435	18,067
2.	Aspirator, low suction	232	1,361,840	68,278	87,548	(19,270)
3.	Blood culture analyzer	20	6,340,000	580,914	88,762	492,152
4.	Blood glucose analyzer	99	192,258	14,434	43,044	(28,610)
5.	Blood pressure monitor, non-invasive	1,374	27,775,410	938,579	1,262,418	(323,839)
6.	Camera, video, endoscope	104	12,814,672	678,319	1,417,957	(739,638)
7.	Centrifuge	399	13,136,676	431,997	497,525	(65,528)
8.	Clinical chemistry analyzer, discrete	33	4,735,500	2,578,614	1,298,350	1,280,264
9.	Counter cell	36	5,356,800	736,322	453,915	282,407
10.	Electrocardiograph	691	19,815,807	617,547	668,896	(51,349)
11.	Electromyograph	24	6,195,432	179,604	32,486	147,118
12.	Immunoassay analyzer, enzyme	24	5,527,992	857,239	178,574	678,665
13.	Light source, fiberoptic	330	7,729,590	578,259	357,344	220,915
14.	Nebulizer, electro-pneumatic	677	1,607,875	68,242	405,424	(337,182)
15.	Nebulizer, ultrasonic	538	4,117,852	240,648	322,183	(81,535)
16.	Pump, alternating pressure	781	2,055,592	118,087	172,987	(54,900)
17.	Spectrometer, mass	2	1,482,000	106,747	17,227	89,520
18.	Warmer, blood fluid	274	3,358,144	114,916	325,925	(211,009)
	Total	**6,087**	**126,814,688**	**9,096,248**	**7,800,000**	**1,296,248**

Source: HA's records and Audit's estimation

Note: These figures are based on the tenders submitted by the EMSTF and Company A in January 2001. Adjustments have been made to take into account the subsequent discounts offered by the EMSTF and Company A.

Acronyms and abbreviations

AHNH	Alice Ho Miu Ling Nethersole Hospital
AMS	Assets Management System
APE	Approved Project Estimate
ASD	Architectural Services Department
BBH	Bradbury Hospice
BH	Hong Kong Buddhist Hospital
BTS	Hong Kong Red Cross Blood Transfusion Service
CCH	Cheshire Home, Chung Hom Kok
CMC	Caritas Medical Centre
COC	Specialty coordinating committee
CPH	Castle Peak Hospital
CWRF	Capital Works Reserve Fund
DKCH	Duchess of Kent Children's Hospital at Sandy Bay
EMSD	Electrical and Mechanical Services Department
EMSTF	Electrical and Mechanical Services Trading Fund
F&E	Furniture and Equipment
FB	Finance Bureau
FC	Finance Committee
FH	Fanling Hospital
FYKH	Tung Wah Group of Hospitals Fung Yiu King Hospital
GH	Grantham Hospital
GSD	Government Supplies Department

HA	Hospital Authority
HAHO	Hospital Authority Head Office
HCE	Hospital Chief Executive
HHH	Haven of Hope Hospital
HKEH	Hong Kong Eye Hospital
HWB	Health and Welfare Bureau
IUVI	Import Unit Value Index of Scientific, Medical, Optical, Measuring and Controlling Instruments and Apparatus
KCH	Kwai Chung Hospital
KH	Kowloon Hospital
KWH	Kwong Wah Hospital
LCKH	Lai Chi Kok Hospital
MMRC	MacLehose Medical Rehabilitation Centre
MOD	Money-of-the-day
MPU	Medical Physics Unit
NDH	North District Hospital
NLH	Nam Long Hospital
NPS	Nominated Product Scheme
OLMH	Our Lady of Maryknoll Hospital
PMH	Princess Margaret Hospital
POH	Pok Oi Hospital
PWH	Prince of Wales Hospital
PWSC	Public Works Subcommittee
PYNEH	Pamela Youde Nethersole Eastern Hospital

QEH	Queen Elizabeth Hospital
QMH	Queen Mary Hospital
RC	Rehabaid Centre
RH	Ruttonjee Hospital
SCH	Cheshire Home, Shatin
SH	Shatin Hospital
SJH	St. John Hospital
SLH	Siu Lam Hospital
SOP	Scale of Provision
TKOH	Tseung Kwan O Hospital
TMH	Tuen Mun Hospital
TPH	Tai Po Hospital
TSKH	Tang Shiu Kin Hospital
TWEH	Tung Wah Eastern Hospital
TWH	Tung Wah Hospital
TYH	Tsan Yuk Hospital
UCH	United Christian Hospital
WCHH	Wong Chuk Hang Hospital
WTSH	Tung Wah Group of Hospitals Wong Tai Sin Hospital
YCH	Yan Chai Hospital