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A BRIEF COMPARATIVE STUDY

MATERIALS MANAGEMENT EFFICIENCY:

BETWEEN

MANUAL /LEGACY SYSTEMS
(ALFRED HOSPITAL, AUSTRALIA)

AND

SENTIENT HEALTH MEDTRAC
(OMUTA HOSPITAL, JAPAN)

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THE PROBLEM & THE STUDY

Hospitals throughout the world consistently report difficulties in maintaining control of their medical consumable and device expenditures. Ithaca and other studies¹ show that the level of waste (obsolescence, expiry, damaged, special needs, duplicated) is generally around 20% of all items on hand – with a further 25-30% of on hand stock excess to requirements and therefore at greater risk of becoming obsolete or expiring or being damaged. In many hospitals clinical and medical staff have carte blanche to order items that are never tracked in the hospital's systems because they are not 'stock', 'imprest' or 'par' items.

The core reason that effective working capital management and control has been so difficult to capture in hospitals is the absence of data on captured at the point and time of use. Everyone seems to know how much they spend – but no-one knows how much they actually use! The 2002/2003 Annual Report of Health Purchasing Victoria (HPV) noted the following key problems with their Strategic Direction #3 addressing Data Collection:

"Although extensive communication regarding the use of the data has been achieved, the securing of timely and accurate data remains a significant challenge for both HPV and health services...many hospitals have found it difficult to provide information, either in absolute terms or in a timely manner to facilitate cost modelling on a hospital-by-hospital basis."

Reports from health services throughout the world mirror this experience – yet every health system / service appears to exist in virtual isolation. Several hospitals / health services have recorded good progress in specific areas of reform addressing this dearth of information – but the lessons are not broadcast – or they are not taken up because "we're different" or "we don't have enough money to invest in long-term improvement".

This study considers a single aspect of the supply chain problem – working capital management and control – as it impacts two hospitals on different sides of the world. One has attempted – and abandoned – an effort to achieve control through a business process reform approach intended to be supported by suitable tools at a point in time, reverting to a manual replenishment process supported by a legacy system best described in the terms used above by HPV. The second hospital addressed in this study has implemented a browser-based solution (MedTrac™) that uses proprietary bar code scanning system with the ability to capture usage at all points of the supply chain and automate previously manual processes – such as inventory management and procurement.

It is intended to expand this study at a later date to include other critical aspects such as the use of non-capable ERP solutions to address supply chain problems, cost-to-serve, logistics network, system integration and process efficiency in delivering required levels of customer service. Further comparative locations – including a 'control' hospital in Japan – may be added to enhance the study.

¹ *Diagnostic of the Australian Supply Chain to Hospitals*, Final Report by PriceWaterhouseCoopers May 2000; *Summary Report of Inventory Reduction & Standardisation Project at The Alfred*, by Ithaca Supply Chain Management Pty Ltd, March 2004; *Efficient Health Care Response (EHCR™)*, USA Industry Report by CSC Health Care 1996

THE REVIEWING ORGANISATION: ITHACA BUSINESS

Ithaca are a 'hands-on', supply chain practice specialising in the delivery of holistic supply chain reform and change facilitation services in the health, pharmaceutical and food sectors.

Ithaca was engaged by Sentient Health to undertake an independent assessment of the benefits – or otherwise – of MedTrac™ at Omuta Hospital as they compared with a hospital where supply chain reform had not been adopted. Ithaca maintains offices in Australia and the United Kingdom and have extensive experience in delivering process-oriented supply chain reform in hospital environments, using their in-depth understanding of operational and strategic issues to facilitate effective change.

Ithaca takes pride in their independence and, while choosing to work with leading edge technology solution providers, they do not promote any software, hardware or other product or service that is not suited to client's specific needs. More information can be accessed at www.ithacabusiness.biz.

THE ALFRED HOSPITAL

The Alfred Hospital is a 320-bed acute treatment and trauma hospital located in Melbourne, Australia. Founded in 1871, The Alfred is Victoria's oldest hospital operating on its original site.

The Alfred has a staff of 3500 and treats more than one quarter of a million patients annually. It provides the most comprehensive range of specialist medical and surgical services in Victoria and accommodates six directorates comprising 42 clinical units, offering every form of medical treatment with the exception of obstetrics and paediatrics.

Today, The Alfred enjoys a reputation as one of the world's leading health care providers – largely attributable to its concentration on specialist "high tech" services including Cardiovascular Medicine, Heart-Lung Transplant, Trauma Care, Oncology and Respiratory Medicine.²

OMUTA HOSPITAL

Omuta City General Hospital is a 350-bed acute treatment hospital located in Omuta City, Fukuoka Prefecture, Japan. The hospital was founded in 1937 and runs 18 divisions to service patients from throughout the region.

SENTIENT HEALTH MEDTRAC - IMPROVEMENT TOOL USED @ O MUTA

Sentient Health's MedTrac™ system was implemented at Omuta Hospital during 2003/2004 and continues to be upgraded and improved as this paper is being written. MedTrac™ consists of a proprietary bar code scanning system which firstly automates the gathering of inventory data at the point of use. Records, able to interface with most hospital systems, can be made of location, patient and staff plus whether the product was used, transferred, disposed or returned.

From this point MedTrac™ Manager, a browser-based application, automates the maintenance of selected inventory levels in each location around a hospital, using demand flow algorithms that dynamically reset inventory levels and reorder points based on demand fluctuations and consumption trends. This is aimed at enabling clients to realize best practice inventory turns links to further automation tools through the Sentient Health Intelligence Network ensuring that when an item balances fall below the stated reorder points, items can be electronically reordered using either XML or EDI messages.

Finally, a reporting and analytical tool - MedTrac™ Analyzer provides pre-built solutions allowing hospitals to capture and package the knowledge and metrics utilized to achieve and maintain profitability including relevant business content in context and key performance indicators.

² http://www.alfred.org.au/about_us.html accessed 08:19 GMT 2nd March 2005

Sentient Health's MedTrac™ system is designed for organisations across the health supply chain – hospitals themselves, distributors and manufacturers – with specific solutions tailored to optimise internal operations for each as well as enable seamless communication between key parties. Such visibility and open communication is a fundamental pre-requisite of the customer efficient, cost-effective supply chains so critically needed in global health sectors today.

CONSTRAINTS AND ASSUMPTIONS

Several assumptions have been made underpinning certain conclusions in the study. It is Ithaca's belief that the findings of this paper are sufficiently detailed to support a high level of confidence in the analysis and the findings made:

- ❖ Due to the lack of detailed and reliable pricing information a like for like extrapolation analysis has been performed. This is based on the assumption that the data is normally distributed and the average (mean) of the stock prices would provide an adequate representation of the stocks without pricing information;
- ❖ Exchange rate was set to 1AUD = 78JPY;
- ❖ The hospitals are similar in size (in terms of number of beds) hence comparisons between the two are made directly without adjustments for size.

This report has been conducted based on information and reports provided by Sentient Health relating to the performance of MedTrac™ at Omuta Hospital, Ithaca's own observations made during a visit to Omuta and Ithaca's own work completed at The Alfred Hospital. The findings reported here as they relate to The Alfred are drawn from Ithaca's work at that hospital during late 2002 and most of 2003 and drawn from the Summary Report on the project – no further data gathering has been undertaken. Work completed by Ithaca at other Australian hospitals and health services – both public and private – indicates that the Alfred experience is typical of most.

The first part of the body of the report examines the nature of the difference between the two hospitals – geographic location, culture and logistics network.

COMPARISON OF HEALTH SYSTEMS: JAPAN & AUSTRALIA

Overview - Japan

Japan's healthcare system combines a mainly private provision of services with mandatory health insurance where service providers are paid directly by the insurer and patients (bearing 20-30% of costs) in accordance with the Fee Schedule established by the Government. A result of this is a high volume of service – the number of consultations per capita per year being twice the OECD average.³

Despite this hospital admissions are well below OECD averages – largely due to an aversion to invasive procedures amongst the Japanese people and the fact that day surgery and laparoscopic procedures are uncommon in Japan. Interestingly the average length of stay once admitted is four times that experienced in other OECD countries – due to the tendency to use hospital beds for long-term care of the elderly. Japan's aging population outstrips that of all other countries.⁴

Overall there are almost 10,000 hospitals in Japan – providing around 1,289 beds per 100,000 persons⁵. Expenditure on healthcare accounts for over 10% of national income (escalating by around 0.6% annually)⁶ and geriatric care accounting for 30% of this amount.

In terms of treatment priorities cancer is the primary cause of death (30.6%), with heart disease (15.7%) and stroke (13%) making up the predominant factors⁷. Death by external causes (accidents, violence etc.) totalled only 3.8% - however suicide accounted for a further 3.1% of deaths. Japan accounts for around one-quarter of the world's renal dialysis patients and clearly geriatric care (including dementia) absorbs a high level of funding.⁸

Case-mix funding was introduced in university hospitals in 2003⁹ – however there is a long way to go on this front and, typically, the use of case-mix in different countries does not lead to an apples / apples comparison anyway due to the very different forms of implementation and application.

Overview - Australia

Australia's healthcare system is underpinned by the public provision of health services funded through a contribution to Medicare paid proportionally through taxes. This is supplemented by a strong private hospital and private health insurance sector, subsidised by Government.

Funding of all hospitals is based on case-mix. Hospitals receive a set amount of money for each episode of a Diagnostic Related Group (DRG) treated. The amount is based on the average length of stay, average labour requirement, average cost of medical/surgical, pharmaceutical, and non-health supplies needed to finalise that treatment.¹⁰

Australia represents 2% or less of the world market for most medical/surgical and pharmaceutical products.¹¹ Suppliers in many countries or regions, commanding large market shares, are able to book manufacturing capacity either in anticipation of demand or as a result of having actual usage information made visible to them by health providers. Australian health suppliers have none of these advantages – the lead times for import can therefore extend to six months in the worst cases – hoping that purchasing rates will be sustained for that period.¹²

³ Health Care Reform in Japan OECD Economics Department Working Paper No. 321 12 Feb 2002

⁴ *ibid.*

⁵ http://www.stat.go.jp/english/data/handbook/c15cont.htm#cha15_2 accessed 09:28 GMT 2nd March 2005

⁶ Annual Report on Health and Welfare 1999: www.mhlw.go.jp/english/wp/wp-hw/voll/p2c3s1.html accessed 29th November 2004

⁷ <http://web-japan.org/stat/stats/02VIT22.html> accessed 10:46 GMT 2nd March 2005

⁸ Health Care in Japan: www.sg.enb-japan.go.jp/JapanAccess/health.htm accessed 29th November 2004

⁹ Ikegami N., & Campbell J.C., *Japan's Health Care System: Containing Costs and Attempting Reform*, Health Affairs Vol 23, Issue 3 pp. 26-36

¹⁰ *Hospital Funding and Case-Mix*, The Danish Ministry of Health, September 1999

¹¹ *Diagnostic of the Australian Supply Chain to Hospitals*, Final Report by PriceWaterhouseCoopers May 2000

¹² *ibid.*

In 2001/02 there were 746 public acute care and psychiatric hospitals in Australia providing 51,461 beds. In the same period 10,504 beds were provided across 119 privately-owned not-for-profit facilities and a further 13,161 beds in 151 privately-owned for-profit facilities¹³. This allows for around 1 hospital bed per 266 persons in Australia.

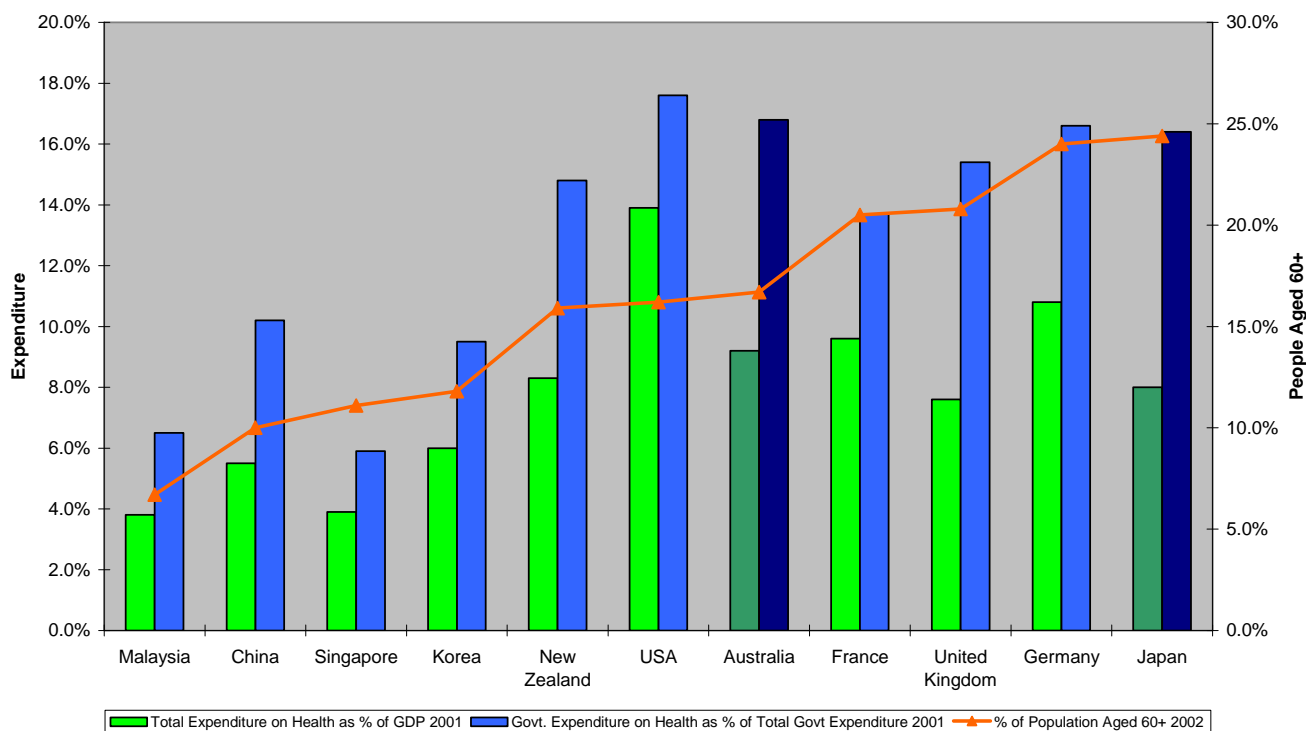
Cancer is the primary cause of death in Australia (28.4%), an incidence that is growing just as the incidence of the second major cause – heart disease (19.2%) – is diminishing. Stroke accounts for 9.3% of deaths however death from external causes (accidents, violence etc.) sits at 5.6% of all deaths with suicide accounting for a further 1.6% only.¹⁴

Often operating as a part of an existing, larger, facility, day hospital admissions are growing rapidly in Australia and there is an increasing tendency toward building facilities specifically for this purpose. A growing part of the market, numbers of these facilities operating on a stand-alone basis nearly doubled from 111 in 1993/94 to 207 in 1999/2000.¹⁵

Statistical Comparisons – Health Systems & Environment

Some key comparisons of the two health systems and their respective operating environments are shown in the graphs below. Conclusions relevant to the current study are then drawn in the next section of the paper.

Health Cost / Aging Comparison

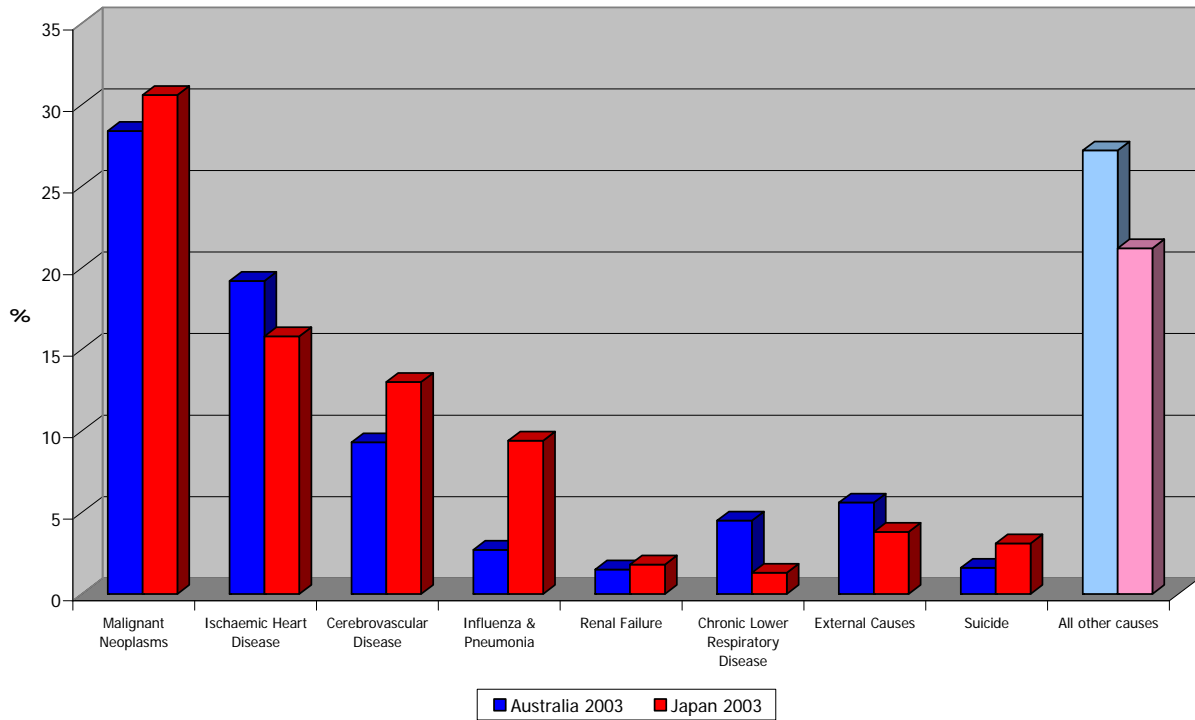


¹³ Australian Institute of Health & Welfare Annual Report 2002

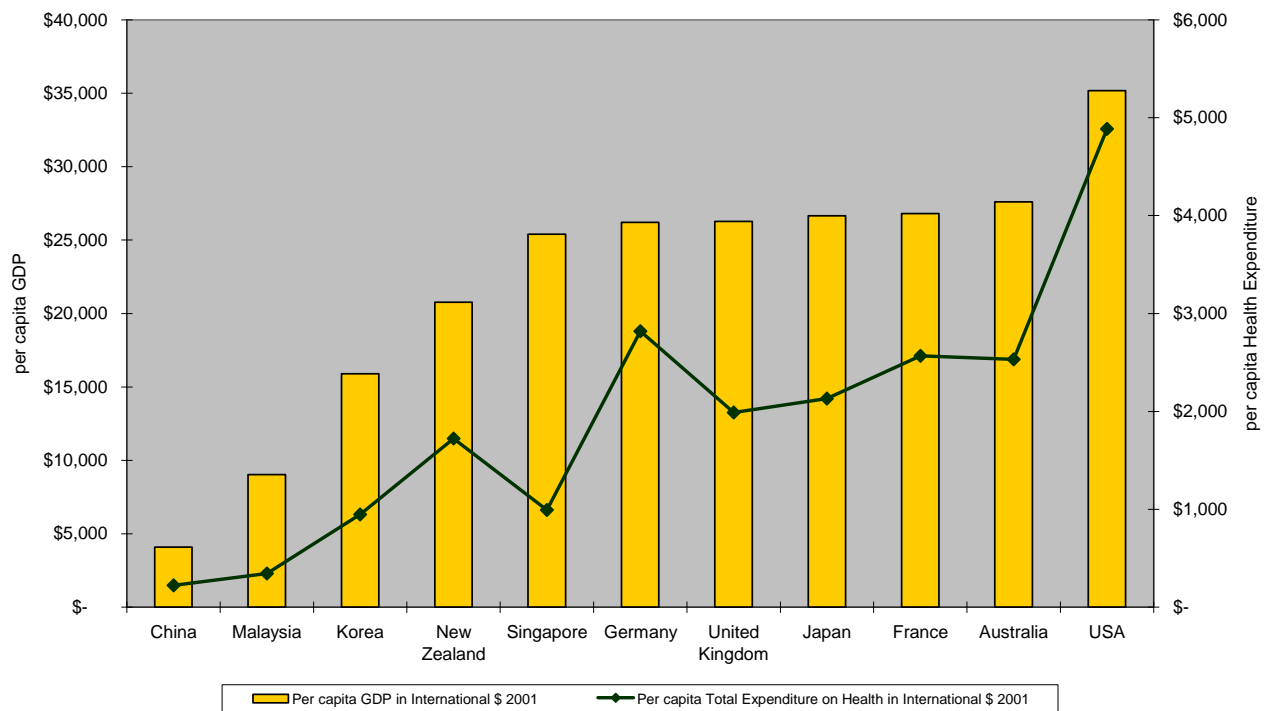
¹⁴ <http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3303.0> accessed 08:25 GMT 2nd March 2005

¹⁵ Australian Institute of Health & Welfare Annual Report 2002

Causes of Death 2003



Per Capita Health Expenditure 2001



Conclusions Relevant to the Comparative Study

A full reading of the documentation researched in relation to the different health systems of Japan and Australia leads to the following conclusions being drawn in relation to this study:

- ❖ It is likely that medical consumable and device usage in Japan is slightly more predictable than usage in Australia – especially in relation to the treatment of chronic conditions such as renal failure and geriatric treatments;
- ❖ Given the economic linkage between Japanese doctors and the supply of pharmaceuticals in particular – but medical consumable and device supply to a lesser extent – one would expect to see over-prescribing and over-usage in these areas;
- ❖ Given the predominance of long-term stays in hospital in Japan – in reality providing aged-care beds in a hospital environment – the requirement for and usage level related to consumables and devices for these admissions will be less than for the generally more acute type of admissions seen in Australia;
- ❖ Japan, as the second largest health market in the world, is able to influence the supply chain for medical consumables and devices more effectively than Australia. As consequence of this may be higher levels of stock in Australian hospitals – and suppliers – than that found in Japan.

Overall, apart from differences in population, the nature of illness and death in Australia and Japan is broadly similar – as it is for all first world countries. Some issues impact more in one country than the other such as the rate of renal failure or death by external causes – but for the purposes of the study it is believed the parameters are sufficiently similar to allow valid comparisons to be drawn – with the provisos mentioned.

STUDY METHODOLOGY

Point-of-use data captured by MedTrac™ over an 11-week period was gathered, reviewed and analysed in order to determine the number of Stock Keeping Units (SKUs) present and stock-on-hand (SoH) value for each location. The methodology applying to this activity is detailed below.

Where possible this was then compared on a unit-by-unit basis (i.e. ICU: ICU, Cancer Ward : Cancer Ward) and on a whole of hospital basis with the same data sets gathered during Ithaca's Alfred project – less any consignment stock that was found as the Omuta figures did not include consignment stock items.

SKUs with no usage data during an eleven week period were considered to be non-performing, in the case of The Alfred these were then categorised as follows:

- ❖ Obsolete Stock (has been superseded by another product);
- ❖ Dead Stock (not been used for 6-months or more but not superseded);
- ❖ Expired Stock (the use-by-date has passed);
- ❖ Damaged Stock (broken, crushed, no longer sterile etc.).

In addition to non-performing stock, two further areas were categorised in The Alfred project:

- ❖ Duplicated Stock (more than one item with identical clinical use)
- ❖ Excess Stock (stock held over the requirements lead-time and usage rate would indicate – leading to greater levels of all the above).

As far as possible the same categories were applied to the Omuta findings – however this proved difficult in most cases as the detailed data breakdown was not available.

To establish inventory turns, daily consumption was derived using the average volume usage of a particular location for a period of time (for Omuta, 11 weeks). Actual SoH was then divided by daily consumption to establish the days stock on hand in each location.

Due to incomplete pricing information, a basic extrapolation exercise was performed in both hospitals to adjust the inventory value:

Adjusted Inventory Value is derived by identifying the total stock volume (if there are 10 items of each of 5 SKUs in a particular ward, the total stock volume would be 50), and the total stock volume with pricing information (if pricing information is only available for 4 of the 5 SKUs, the total stock volume with pricing information would be 40). Identified inventory value is then adjusted up by the adjustment indicator (in this case $50/40 = 1.25$).

FINDINGS

Stock-on-Hand Coverage & SKU Proliferation

A synopsis of the findings relating to number of SKUs and value of SoH is as shown in the table:

SKU/SoH Comparison	Omuta Hospital	Alfred Hospital
SKUs	9,096	19,092 Consignment 2,243
Adjusted SoH Value AUD\$1 = 78JP¥	AUD\$397,559 ¥31,009,597	AUD\$3,717,177 ¥289,939,779 Cons - \$1.97 Million ¥153,989,550

Overall the value of SoH on any given day in the Alfred exceeds that in Omuta by 17 times. Once consignment stock is removed from the equation this number reduces to 1:9.35.

Whilst the nature of each hospitals' service profile and

environmental factors pointed out earlier account for part of this, the difference remains substantial.

In the absence of a Japanese control hospital study and assuming that the working capital management of Omuta lacked visibility and relied upon ad hoc ordering and imprest processes before the introduction of MedTrac™ this evidence dramatically supports the use of point-of-use data collection and automated replenishment systems such as that provided by MedTrac™ at Omuta.

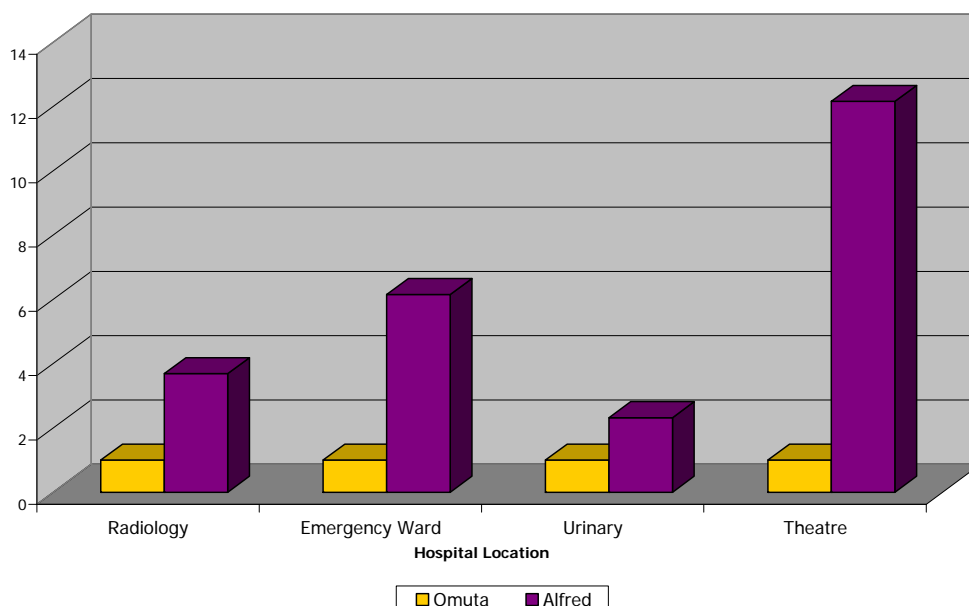
It is worth noting that Ithaca's assessment of the opportunity for improvement at The Alfred was:

- ❖ Stock items provided by Supply could be reduced from 25 to 8 days coverage;
- ❖ Stock items provided by CSSD could be reduced from 80 to 8 days coverage;
- ❖ "Non-Stock" items could be reduced from 197 to 50 days of coverage.

In both hospitals the number of SKUs includes items held in multiple locations being accounted for numerous times. It is worth noting that many Alfred clinical and medical staff are able to order any item for any purpose deemed necessary without further authorisation – items never properly recorded in hospital systems. This uncontrolled expenditure is a major contributor toward the waste identified.

Relevant wards in Omuta were grouped into specialties and compared with the corresponding locations in the Alfred, allowing a more detailed comparison on the basis of specialty. It must be remembered here that The Alfred covers 19 specialties within its Theatres, a greater number than Omuta's range and also, Alfred is the major trauma centre for a city of 3.5 million people, representing a greater pool of potential patients:

Ratio SoH Coverage Omuta:Alfred



SoH Analysis – Specialty Areas	Omuta	Alfred	Omuta : Alfred
Radiology	¥6,666,249	¥24,638,328 Cons ¥9,635,964	1 : 3.69
Emergency Department	¥1,250,604	¥7,699,477 Cons ¥3,222,317	1 : 6.15
Urinary Ward	¥626,789	¥1,458,123 Cons ¥769,947	1 : 2.32
Theatre	¥10,793,917	¥131,306,351 Cons ¥81,614,461	1 : 12.16

Comparison of Waste (Non-Performing Stock)

Ithaca's measurements in all hospitals lacking usage information for medical consumables and devices shows that between 35% and 50% of SoH will fall into one of the following categories:

- ❖ Obsolete Stock – no longer in use, superseded by something else but is still on the self (around 18 – 20% of all stock-on-hand);
- ❖ Expired and Damaged Stock – self explanatory (less than 2%);
- ❖ Dead Stock/Special Needs – used less than once every six months and can be ordered in on an 'as required' basis given robust business process management and suitable supporting tools (less than 2%);
- ❖ Slow Moving Stock – used less than once every six months but is critical stock item and cannot be dispensed with (less than 1%);
- ❖ Duplicated Stock – Multiple items (different brands, different manufacturers) that are used for identical clinical purposes and producing identical clinical outcomes but stock is maintained for each. These are predominantly commodity items (bandage, tape, dressing etc) that can be standardized with zero impact on clinical outcome (up to 10%);
- ❖ Excess Stock – stock held in excess of usage and safety stock requirements – often dependent on various factors. e.g. Supplier Contract Arrangements, Minimum Order Quantities, break-bulk capability, lead time, scarcity and consequence of stock out episodes. (up to 25%).

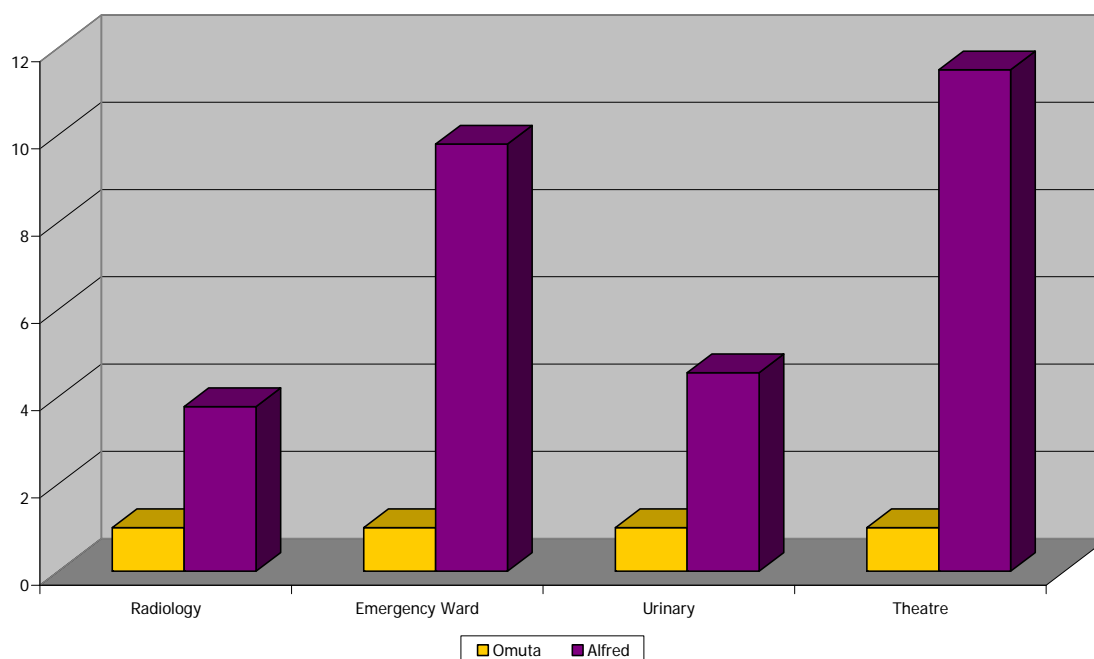
In this study, as differentiation of the Omuta stock was not possible, all non-performing stock has been grouped together for comparative purposes, less the consignment stock components identified in the stock-on-hand comparison.

Non-Performing (N-P) Stock	Omuta Hospital	Alfred Hospital
Value of Non-Performing Stock	¥14,066,634	¥55,655,652 Cons ¥59,314,592
% of SoH Non-Performing	45%	58%

Again, an extrapolation was performed for particular specialty areas of each hospital. Again, whilst it must be kept in mind the nature and range of services offered by each hospital and the environment in which each operates, the evidence of waste when relying on manual inventory management is clear in comparison with the use of a point-of-use tool:

N-P Stock, by Specialty	Omuta	Alfred	Alfred Cons	Omuta : Alfred
Radiology	¥1,885,674	¥7,124,709	¥6,243,964	1 : 3.78
Emergency Ward	¥437,778	¥4,368,678	¥1,091,322	1 : 9.97
Urinary	¥268,487	¥1,223,004	¥397,212	1 : 4.55
Theatre	¥3,683,956	¥42,348,983	¥29,873,008	1 : 11.49

Ratio Omuta:Alfred Non-Performing Stock in Specialty Areas



MedTrac™ is still in its early stages at Omuta and there clearly remains a significant opportunity to improve the waste levels in the hospital – even so, the situation is significantly better than that measured at The Alfred. Ithaca’s work at the Alfred showed that over 50% of stock was either obsolete, expired, damaged, special needs or excess to requirements so this comparative outcome is not surprising.

We considered whether the non-performing stock at either hospital consisted predominantly expensive, high-end devices and found:

- ❖ Alfred waste was spread across all item categories relatively evenly – showing particularly the level of opportunity for standardisation and rationalisation – most particularly in the consignment stock area;
- ❖ Omuta waste was just over 50% concentrated in a relatively small number of high-end specialty areas such as theatre and angiography – the remainder was spread.

Inventory Turns Comparison

To determine the inventory turnover, the daily usage of each item volume was calculated and the stock on hand volume was then divided by the daily usage volume.

- ❖ 52.39 days SoH was found to be in Omuta Hospital on any given day – inclusive of the non-performing stock identified – based on an extrapolation of usage rates for the 11-week period that was reviewed;
- ❖ 83.65 days of SoH was found to be in The Alfred Hospital on any given day – inclusive of non-performing stock and consignment stock – based on annual spend of around AUD\$25 million.

In terms of inventory turns this translates to 6.97 turns per annum for Omuta and 4.4 turns for Alfred – both hospitals have plenty of room for improvement on this assessment however the tool being used by Omuta provides the management information required to enable such improvement whereas Alfred will struggle to overcome poor or non-existent stock and usage visibility.

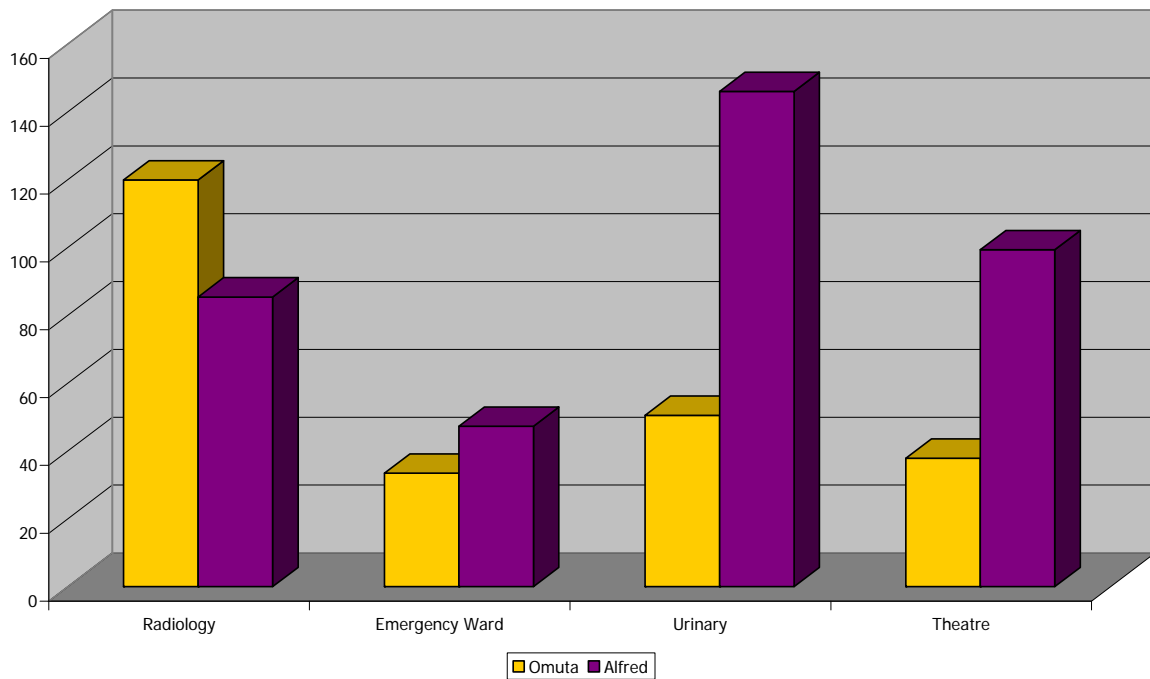
As any given point in time, The Alfred would contain several times greater SoH than Omuta. A more detailed comparison was performed on the basis of the specialty, less consignment stock:

Days of Stock-on-Hand	Omuta	Alfred	Omuta : Alfred
Radiology	119.92	85.40	1: 0.71
Emergency Ward	33.44	47.30	1: 1.41
Urinary	50.51	146.00	1: 2.89
Theatre	37.87	99.31	1 : 2.09

Interestingly, the only area in which Alfred has bettered Omuta's results is Radiology where a pilot point-of-use data collection, automated replenishment and prostheses tracking system was implemented during 2003 – demonstrating in a comparative sense within one hospital what can be achieved with the right tools in place.

A further item of interest in this aspect of the comparison is that, although the level of waste in The Alfred is so much greater than that found at Omuta, the actual usage of performing items is high.

Days Stock-on-Hand



CONCLUSION

The basis of this study was to comparatively examine a core element of supply chain management at two similar hospitals in different countries – Australia and Japan. The element being examined was inventory or working capital management of medical consumables and devices.

Typically, as we have reported, the purchasing of such items accounts for between 20 – 30 percent of hospital expenditure hence effective management of such assets is critical to efficient performance. Management of these items is even more crucial in terms of ensuring patient safety and the ability to provide treatment in a timely and appropriate manner.

As we saw early in the document, inventory management relating to medical consumables and devices has been demonstrably poor for many years – with between 20 and 30 percent of all items purchased in a manually-run system never being used on a patient in many hospitals!

MedTrac™ - and similar point-of-use data collection systems, linked to automated inventory management and procurement capabilities such as those provided in MedTrac™ Manager, can clearly make an enormous contribution to improving inventory management and opening up supply chain visibility for hospitals with a view to eliminating inventory waste. Such tools provide, without doubt, a great leap forward for hospitals who continue to rely on manual or legacy-based replenishment and inventory systems.

This study has not considered the broader conduct of supply chain operations in either The Alfred or Omuta hospitals, nor has it examined a 'control' hospital in the Japanese setting. To truly gain a full and clear picture of the benefits realised, a more complete study would need to be made looking at the trade-offs and balancing factors in all parts of the supply chain.

