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Bwrdd Iechyd Prifysgol
Caerdydd a'r Fro
Cardiff and Vale
University Health Board

AGENDA ITEM 2.2
22nd February 2011

SUPPLY CHAIN REVIEW

Report of	Assistant Director of Finance/Procurement
Paper prepared by	Head of Supply and Logistics, Fundraising & Commercial Development Major Service Improvement Manager
Executive Summary	<p>One of the key objectives within the Procurement Department for 2009-10 was the provision of a more efficient and effective supply of goods and materials to the wards and departments throughout the Health Board, and as a result, in discussion with the then Head of Procurement a review was commissioned.</p> <p>The review established that the current purchasing and supply chain system was a complex weave of material flows involving a number of different staff groups, including (but not limited to)</p> <ul style="list-style-type: none">• the purchasing team,• materials logistics staff,• IT specialists in procurement,• stores and ward staff. <p>Main findings from the evaluation suggest that :-</p> <ul style="list-style-type: none">• The processes, when combined, prevent an effective flow of materials to the ward and indeed create the need for manual 'work arounds'.

These 'work arounds', are manual systems put in place as the current system does not meet the flow required to achieve maximum benefit, and result in additional work for staff, in particular Nursing.

- A 'silo' approach within the Procurement Department, i.e. the purchasing, contracting, stores and Oracle team adopted a distinctive unit approach rather than a departmental approach to the supply chain process.
- Challenges that emanated from the lack of a uniform and integrated IT system were identified. The UHB has multiple IT systems that control a complex process of getting materials to the wards. All of these systems and processes, when combined, have significant drawbacks and require manual 'work arounds' which result in non-value added processes leading to waste and inefficiencies across the supply chain.

The report concludes with a number of recommendations to support the redesign of the supply chain:

1. Adoption of the 'Direct to Ward' supply initiative, this would harness the capabilities of the supply base to select appropriate products for wards delivered in a timely fashion. The direct to ward initiative involves stock arriving to the UHB in boxes and delivered to the ward from stores and as a result of the stream lined service inefficient and ineffective practices would be eradicated.

	<p>2. In addition, the report advocates the adoption of a uniform IT system. A common IT system, with an improved material flow, would release an enormous amount of opportunity cost recoveries as well as practical benefits for staff (productivity increases and greater ability to engage with business improvement). Indeed it is purported that the move to a common IT system could release circa 2 hours, conservative estimate, of nursing time as the system would be more customer/ward focused.</p> <p>3. Finally, the report recognises the changing NHS context, in particular the move to NHS Wales Shared Services. In light of these changes the recently appointed Assistant Director of Finance/Procurement for Cardiff & Vale UHB and Cwm Taf has agreed to develop an Action Plan in response to the report to ensure that supply chain services are streamlined, effective and efficient, and are in line with the strategic direction for Procure to Pay Services.</p>
Action/Decision required	The Committee is asked to note the report and approve the proposed recommendations
Link to other Board Committee (s) and sub-committees	N/A
Link to Standards for Health Services in Wales	Standard 1 - Governance and accountability framework in relation to section c - secures the efficient, effective and economic use of resources
Link to Public Health Agenda	N/A

FOR DECISION

Link to UHB Strategic Direction and Corporate Objectives / Legislative and Regulatory Framework	To ensure the University Health Board delivers its supply chain effectively thus releasing nursing capacity and consumable efficiencies
Link to relevant evidence base	Best practice and nationally benchmarked standards

SUPPLY CHAIN REVIEW

BACKGROUND

The purpose of this study was to identify the most effective and efficient method of providing goods and materials direct to ward, by utilising and improving existing systems and technologies. The study therefore reviewed the needs of key stakeholders, IT systems and working practices with the intention of designing a pilot project to test a small sample of wards and departments to deliver a solution that delivered stock to the ward in a timely manner.

It is acknowledged that material costs represent a significant item of expenditure and whilst the type of stock needed is predetermined by the type of ward involved, the quantity of stock is not. Excess quantities of stock consume cash flow and often result in unnecessary waste as products reach their 'shelf life' and must then be disposed. Indeed, recent initiatives to de-clutter wards has shown excessive and out-dated stock to be an issue and the product rationalisation team has shown considerable scope to reduce the variants of items to more appropriately meet the needs of the wards.

At present there are multiple routes to get goods and materials from suppliers/ providers to the wards and this is confusing to staff. These routes include:-

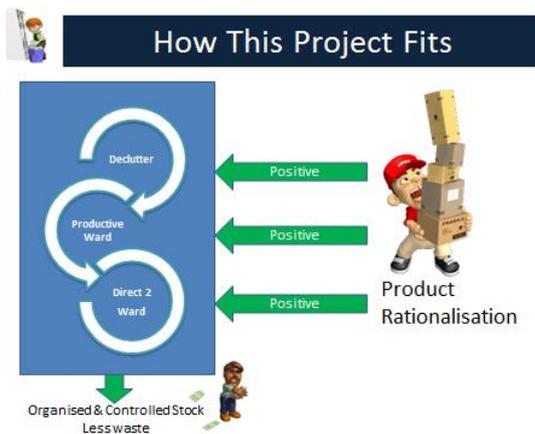
Sophisticated computerised inventory systems that track consumed stock to the patient (e.g. Medtrac in Theatres Llandough) to manual systems. It is acknowledged that each route has disadvantages around the most cost effective methods of stock management at the organisational level.

The supply of materials is further complicated by a number of legacy systems and preferences. In the main there are two significant providers (accounting for the bulk of stock volume), (i) Welsh Health Supplies and (ii) NHS Supply Chain. In addition there are a variety of external suppliers who range from unique and bespoke supply of custom items to suppliers of niche products that are bought irregularly. As a result there is confusion as to what products are known as 'stock' (i.e. held in inventory at the ward or in central stores) and what is non-stock and needs to be procured each time (i.e. authorisation process required).

As well as the myriad of suppliers, there are a number of IT systems which support the supply chain process. The lack of a uniform, integrated system results in diseconomies of scale, it is not possible for the team to focus their efforts and exploit the advantages of a single system and also to design the working procedures needed to make that system work efficiently and effectively.

How This Review Fits With The Bigger Picture

It is well recognized within the Health Board that there were a number of other change initiatives which had commenced and which would impact on this particular project, i.e. principally the decluttering programme and Transforming Care (Releasing Time to Care).



The evidence from each of these work streams supports the view that the current supply chain process contains inefficient and wasteful processes. Each work stream on its own has realised a number of benefits at an individual ward level, however, the opportunities that could be released by a combined approach are considerable and include:

- A means of adding new levels of control for material ordering systems whilst reducing waste and as a consequence the costs to service patients;
- Product rationalisation;
- Improved environment;
- Releasing time to care, a minimum of 2 hours of nursing time is reported.

OBJECTIVE

The primary objective was to review existing supply chain processes and to make recommendations resulting in a more seamless system to deliver efficiencies across the total supply chain.

It should be noted that during the review a number of visits and discussions were held with other organisations that had implemented similar systems, namely St Thomas's and other international centre's of excellence such as Virginia Mason. Additionally, supplier visits were undertaken to further understand the current fulfilment process for orders.

THE CURRENT PROCESS

The Material Supply System

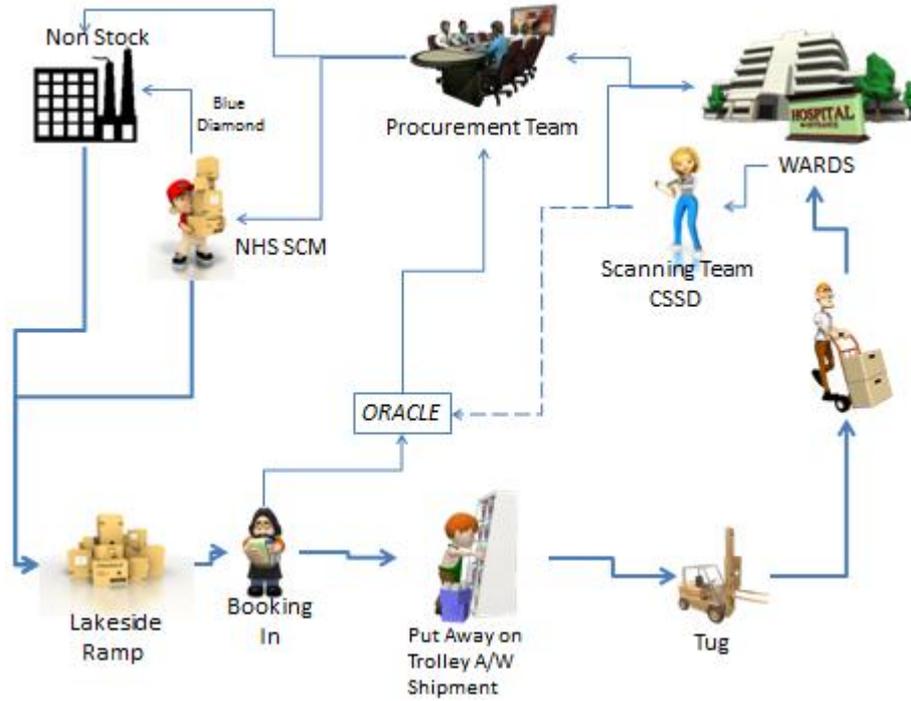
The material supply system at UHB has many features that make it ideal for automation and the extended use of scanning hardware to allow direct to ward supply. Such system features are also supported by a physical logistics system that is capable of supporting a 'direct to ward' programme. These 'enablers' are not that easy to develop and the staff at UHB have done well to embed these good practices. In summary the UHB system has:

1. High flows of identified product – top 12 supply destinations of 290 comprise 80% of all flows
2. Known destinations with relatively known demand profiles (appendix 1)
3. Regular ordering of materials
4. Known official routes to the wards for material supply

The basic elements of the supply chain are therefore in place and capable of being built upon. Set locations with set routines and set products make the system development a real opportunity to reduce waste and streamline the supply process (to make efficiency gains and also to release staff time so they can engage in more value-adding projects). At the ward level there are also set shelving locations with known sizes to accommodate products and materials.

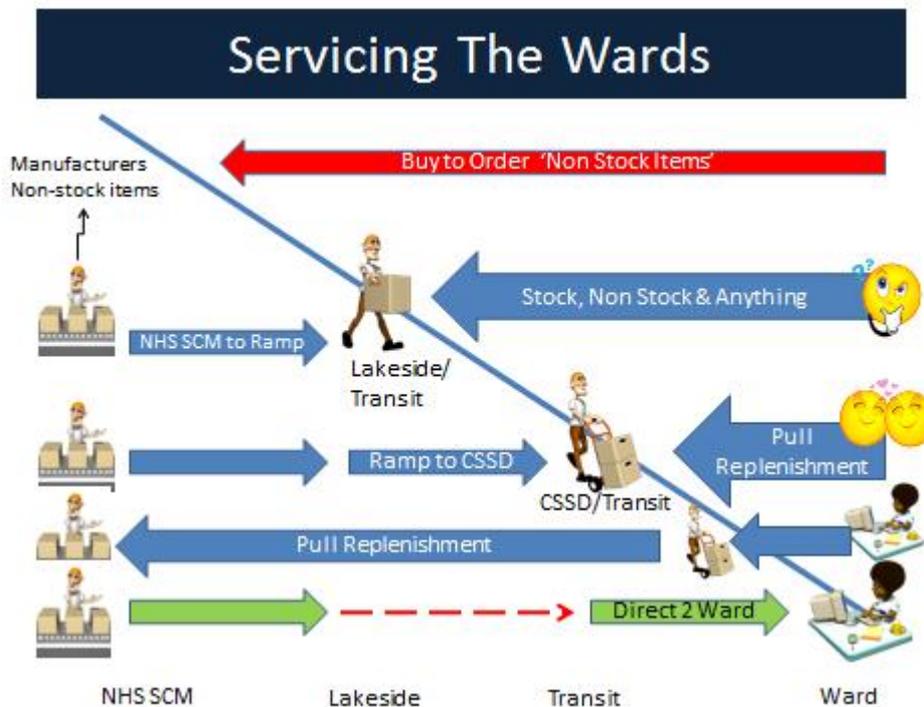
The current process is illustrated below:

A System Map of Information & Material Flow



Servicing The Wards: Internal Logistics

There are various routes to service ward stocks as identified in the diagram below:



The methods include:

- Buy to order – for truly 'non stocked' items and where the specialist support of the procurement and supply chain teams are needed to specify, source and order materials.
- Non stock items that are items not held as standard items at the ward (but may be regular items needed at the ward - the terminology is confusing to staff). These items are subject to a lengthy requisition and sign-off process within the directorate – even though they are items used regularly by that ward. Items that are used regularly should be deemed as STOCK and ordered using a replenishment system.
- Stock items – these are items stocked at the ward and are replenished or topped up.
- CSSD – is a holding area for common items (items needed by several wards) and this stock is pulled by materials handlers based on what is needed at the ward (basically what needs to be topped up).
- Manufacturer Stock – items that are bought from the manufacturer.

- Direct to Ward – the subject of this study which is the picking of products and packaging of ward base requirements into tote boxes for shipment to the ward.

The process is a pull system and is based on what has been used. The system should be designed to replenish stock within 48 hours of reaching a trigger point and also use safety stocks at the ward level to avoid running out. The system is based on regular scanning of shelves.

Current State: Excess Ward Stock

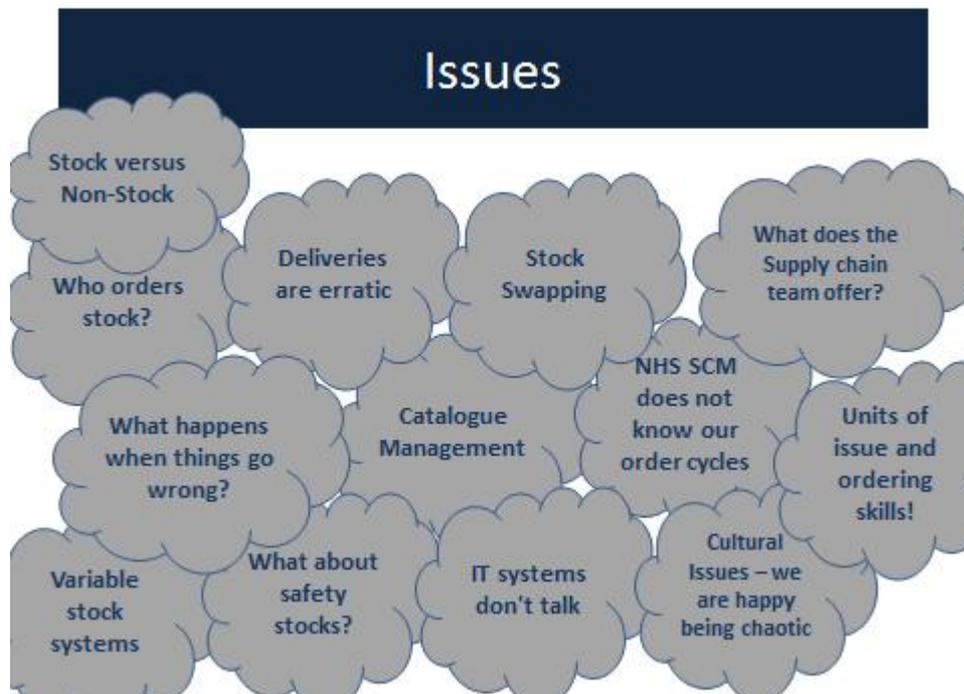
The review identified that the current processes lead to inefficiencies and waste, and ultimately results in direct and indirect costs to the organisation. Based on a review of the current system and when benchmarked against other centres it is suggested that a minimum of 2 hours per week of qualified nursing time is 'lost' as a result of these inefficient processes.

The Main Issues with the current process

The supply of materials to the wards has many issues that cause senior qualified staff to lose 'time' when ordering supplies. The way in which stocks are supplied to wards is complex and subject to delays, losses and large over-stocks of materials (including items passing beyond their shelf life).

The main issue affecting the current system of supply is related to the inadequacies of the existing IT system rather than the physical process of moving stock. Most staff voiced concerns that supplier performance is erratic and many staff cited instances when suppliers had failed to supply items without stating when and if this would be delivered therefore resulting in duplicate orders.

As part of this review several ward managers were interviewed (Voice of the Customer) and the following were identified as many reasons for the system failing:



The identified non-value added steps within this process include:

- Transportation of items to different parts of the hospital from Lakeside
- Booking in items at various points within the system, but who has the responsibility for this important role, i.e. ownership
- Role of ward managers within the ordering system
- Nursing staff re-stocking CSSD items therefore distracting them from direct patient care
- No clear responsibility for stock rotation
- Delivery of CSSD from Lakeside to wards

Most other issues concern the policies and processes needed to make the system work:

- The IT systems no longer supports the UHB's operating model and are predicated on a system of central storage at the hospital site (this is the typical supply chain at Welsh hospitals).
- Back office operations (even under the former operating model) are inadequate and catalogue management is costly in terms of labour time to update the system, the ADC hardware has limited memory and storage, and invoice matching is poor. Also returns policies are not clear.

- The computer system outputs are just to order, receipt, transfer and consume stock. The current system is not fit for purpose in the way it is needed to support the supply chain process within the UHB. The CSSD operation works well with the ADC system but it is not possible to extend this service (space and costs).
- The ADC system is a basic system that needs upgrading in order to offer an effective and efficient solution; this has been identified as an issue for the whole of NHS Wales, and has been scoped as part of a solution under the NHS Wales Shared Services project.

KEY FINDINGS

The findings of the report show a significant opportunity for improvement. The report also states there are significant weaknesses and issues with the current model of operation as well as significant levels of staff stress/manual workarounds/potentials for error. In addition, the findings reveal that a large amount of labour time is consumed in getting products to ward shelves and that many 'back office' staff spend 'unnecessary' time in 'making the system' work. The amount of support is disproportionate and actions need to be taken to help these staff move to more value adding activities and away from reactive routines (such as invoice matching, manual receipting etc.).

The specifying findings for the review are as follows:

Collected Ward-Based Voice of the Customer

- Wards are overstocked and many have 'hidden stores' of goods that were over-ordered
- Staff are confused about what is stock and what is non-stock
- Circa 2 hours a week (minimum) is consumed in administering the material supply system
- Some materials just arrive on the ward, some of which are no longer needed
- Many wards admit to 'borrowing' products from other wards
- The staff do not understand the returns process
- Staff get frustrated with the lengthy delays in 'signing off' orders

- The wards like the instant service of CSSD scan and replenishment but the wards were ignorant of their own demand for products
- Back order system does not work therefore nursing staff unclear if orders are going to be delivered which can result in duplicate orders

The view of the scanners and ability of suppliers to scan

- Both major suppliers to the organisation show the capability to conduct a direct to ward system. However, the organisation needs reassurance that automatic receipting, back order management and catalogue updates can be done efficiently
- The current ADC scanners are at their maximum memory level and will need to be upgraded
- The scanning teams can meet the demands of a daily/2 day scan especially if ward staff cooperate and add manual (visual management) systems that show the scanner what has reached minimum levels
- No computer system operates with ward staff scanning out their own materials and creating a self-managed reordering system

The stores team and supply to Wards

- It is possible to deliver to Lakeside stores but not to the central lifts
- The CSSD process works very well and in the future it would be possible to use suppliers to pick these materials (subject to a service level of 48 hours) and this would release staff time to manage stocks in a better way
- The tug delivery process is efficient but is limited in its capacity. The Transit Stores could be used as a receiving point but it gets congested during certain times in the working day and the space available is quite small for combining loads from the two major suppliers
- The teams are very competent and willing to test new ways of working

- There is much to be gained by levelling (or redirecting) the amount of receivables at Lakeside. There is poor performance by general suppliers and there is insufficient time to do more than quantify and sort inbound goods
- Lakeside has a confusing array of customer destinations and these need to be reviewed to see whether they remain viable or should be rerouted direct to these healthcare organisations rather than congesting the UHW site.

The Suppliers View

- The suppliers cannot understand the demand profile sent to them by the organisation and need to understand the UHB system.
- Suppliers proposed sites that operated the direct service and claimed that they could deliver to a 48 hour turnaround
- One supplier was concerned that ‘folklore’ existed at the ward level – these myths include the inability to return stock and single item returns

CONCLUSION

The current purchasing and supply chain system was found to be a complex weave of material flows involving a number of different staff groups, including the purchasing team, materials logistics staff, IT specialists in procurement, stores and ward staff. As a result of the processes involved the review identified significant ‘waste’ in the system creating the need for non-value added processes such as manual ‘work rounds’. Additionally the lack of an integrated and uniform IT system has added to the complexity. Whilst it is acknowledged that the current system does meet the needs of some of its consumers, the overarching conclusion of the review is that the combined effect of the current modus operandi has resulted in an inefficient and ineffective supply chain system across the UHB.

RECOMMENDATIONS

As a result of the findings of the review, the recommendations focus on the requirement for an 'ideal supply chain' system. The major features of an ideal system include a system that is controlled with a single IT system, uniform hardware scanning technology, very low levels of manual intervention to support material flow, receipting and reconciliation processes, and, a system that can be accessed by all suppliers (transparency of demand and slot timed delivery window booking facilities etc.). The benefits of a workable system are significant; a 'noise' free material flow process will have direct impact on cash flow, wastage, ward space, team productivity, site traffic congestion and huge relief of employee stress. In real terms the 'ideal' system would be self-managing and founded on barcode technology to allow minimal data entry.

In commending the development and implementation of this system the following specific recommendations are made:

1. Adoption of the 'Direct to Ward' supply initiative would harness the capabilities of the supply base to select appropriate products for wards delivered in a timely fashion (appendix 2).
2. A common IT system, with an improved material flow, would release an enormous amount of opportunity cost recoveries as well as practical benefits for staff.
3. Building on the findings from the 'test' wards on the 6th floor at UHW, develop and implement an integrated pilot project plan to incorporate the three transformational programmes of Supply Chain Management; Decluttering and Transforming Care.

The report recognises the changing NHS context, in particular the move to Shared Services. In light of these changes the recently appointed Assistant Director of Finance/Procurement for Cardiff & Vale UHB and Cwm Taf has agreed to develop an Action Plan in response to the recommendations contained within the report to ensure that supply chain services are streamlined, effective and efficient.

Appendix 1: Overview of the Material Supply Chain System

1. Supply destinations

Critical Mass

- Top 12 supply destinations of 290 are 80% of all flows

TR6 report for Financial Period 10 JAN Financial Year 2010

Code	Name	Lines Requested	Lines Supplied	Service Level %	Cumul %
CG1964	752000 LLAND THEATRE	506	494	97.63	36.5%
CG1892	CVT LAKE SIDE STORE	271	238	87.82	50.9%
CG1723	722382 THEATRE RECEP	424	417	98.35	61.1%
CG0045	750000 GENERAL STORES LLANDDOUG	218	200	91.74	65.1%
CG007A	(722525) UHW RADIOLOGY	0	0	0	68.3%
CG2111	758101 TH ANAEST LLAN	78	78	100	70.3%
CG1565	722144 DAY UNIT BG	86	86	100	72.2%
CG1721	722380 MAIN TH UHW 3RD FL	70	68	97.14	74.0%
CG1620	722233 LG H/K	32	29	90.62	75.5%
CG0000	722186 C.P.U UHW	153	146	95.42	76.8%
CG1702	722345 GENERAL ITU B	54	54	100	77.9%
CG2043	754457 THEATRE SCRUB	132	110	83.33	79.1%
CG0058	(722524) TRANSIT STORES	10	8	80	80.2%
CG1516	722061 AUDIOLOGY	10	10	100	81.2%
CG2050	754476 LLAND LINEN R	4	4	100	82.1%
CG1606	722214 MATERNITY 2ND	14	14	100	82.7%
CG1570	722149 HAE MAGY WARD	15	11	73.33	83.3%
CG1541	722099 OPHTHALMOLOGY	4	4	100	83.8%
CG1658	722285 UHW SCUB 2ND FL	23	22	95.65	84.2%
CG2116	CVT LLANDDOUGH STORE	40	39	97.5	84.6%
CG005F	(763602) PONTYPRIDD DENTAL CLU	69	57	96.51	85.0%
CG1977	764210 LLAND CYSTIC	7	7	100	85.3%
CG0028	(762552) DENTAL HOSP ORAL HEAL	66	63	95.45	85.7%
CG1863	762544 DENTAL CONS	49	46	93.88	86.0%
CG1503	722013 MLU UHW	3	3	100	86.3%
CG2176	720022 DENTAL SDH	31	30	96.77	86.6%
CG1697	722340 ADULT CARDIAC	15	14	93.33	87.0%
CG2106	765328 BREAST CARE LHS	23	23	100	87.3%
CG1625	722239 PAED CARDIAC	22	22	100	87.6%
CG2056	754502 LLAND EMERGENCY	27	27	100	87.8%
CG1635	722250 PHYSIOTHERAPY	4	4	100	88.1%
CG0007	722559 UHW CARDIAC C	8	8	100	88.3%
CG0043	(765463) DENTAL-HOLLIES DENTAL	44	43	97.73	88.5%

Delivery Points, Stocks & Flow

Unit of Man	Req point	Req point description	Stock delivery location	Stock Delivery location description	Preferred delivery day
					Mon Tues Wed Thurs Fri
1	CG0000	722186 C.P.U UHW	CG1009	CPU STORES (NEXT TO LAKEESIDE STORES) CF14 40W	Y Y Y N Y
1	CG0001	755349 WARD WEST 1 LLAN	CG1003	LLANDDOUGH GENERAL STORES (CAGES) CF14 20X	Y N Y N N
1	CG0002	722176 HEATHFIELDS	CG1009	CPU STORES (NEXT TO LAKEESIDE STORES) CF14 40W	Y Y Y N Y
1	CG0005	754458 LLANDDOUGH CAVOC UNIT	CG1003	LLANDDOUGH GENERAL STORES (CAGES) CF14 20X	Y Y Y N Y
1	CG0007	722559 UHW CARDIAC C	CG1003	TRANSIT 2 STORES (THEATRES) CF14 40W	Y N Y N Y
1	CG0008	722462 PRE-ASSESSMENT CLINIC	CG1008	UNIVERSITY OF WALES (PALLET) CF14 40W	Y Y N N Y
1	CG0009	751434 PENARTH HC PDS	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	Y N Y N N
1	CG000C	755344 RAWNS UNIT LLAND	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	Y N Y N N
1	CG000D	720021 CDS DENTAL ST DAVIDS	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	Y N Y N N
1	CG000E	722449 COMMUNITY PENARTH PO	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	Y N Y N N
1	CG000F	722457 FAM PLAN CLIN ANAT	CG1010	TRANSIT STORES -(CAGES) CF14 40W	N Y N Y Y
1	CG0010	722471 HLTH & SAF DEN HSE 4T	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	N N N N Y
1	CG0011	755337 LRNG CANCER LLANDDOUGH	CG1003	LLANDDOUGH GENERAL STORES (CAGES) CF14 20X	N N Y N N
1	CG0012	755344 RAWNSLEY UNIT LLANFAI	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	N N N N Y
1	CG0013	722445 WASTE DEPARTMENT EST	CG1010	TRANSIT STORES -(CAGES) CF14 40W	N Y N N Y
1	CG0014	755344 RAWNSLEY UNIT LLANFAI	CG1014	LAKEESIDE MAIN STORE (PALLET) CF14 40W	N N N N Y

2 days Min

So you need a minimum of 1 weeks stock of everything ←

Appendix 2

Pilot

The wards operate different types of supply system which range from the Ward Manager conducting all reviews, to a ward clerk system. The teams were fully supportive of this project.

The teams are all drawn from the 6th Floor at UHW and have been reviewing their stocks from ordering lists. Many wards have found anomalies and differences between what our systems think are there, what is there and what is really needed. The ward teams have therefore been cleansing data. In parallel Llandough's West 3 have been piloting EDC on a ward that has been decluttered and had Releasing Time To Care initiative.

The staff have:

1. Reviewed a stock list and investigated the annual and weekly stock levels (noting any changes).
2. Identified items that are seasonal and should be stocked at certain times in the year.
3. Identified any items ordered by others i.e. operational services so need to be stocked but the ownership of the ordering rests with someone else.
4. Noted exceptional items that were used for an individual patient (unlikely to be needed again).
5. Identified items that are out of stock on a regular basis,
6. Identified items that are missing from the list which should be stocked on your ward.

We have also investigated each ward and the future layout of the new ward systems to see what space is available for stock. It should be noted the new layouts have much less square metres for stock and some may have to be shared between the two ends of the new wards. There are also many doorways through which staff with materials must pass to get to patients so material handling issues may become evident.

In terms of the existing wards, most of the grey shelving (figure 1) is fit for purpose and the transparent trays can be subdivided so that each item of stock has a picking location and a reserve. When the picking location is exhausted then the reserve is used and during this process of switching the scanner can see replenishment is needed (figure 2).

The wards will have to create these divisions but the physical space is there to engage this form of visual and simple material management.

The Grey Shelves (figure 1)



The yellow barcode tags can be seen easily and this would need to be extended to all products in every tray to achieve a single system.

As such there is a lot of improvement activity that can happen at the ward level. These will build upon the features of the 'Well Organised Ward' module of RTTC (Releasing Time To Care). These improvements should go ahead regardless of what happens with the computer IT systems but, in doing so, the improvement should be implemented in a way that allows the barcode project to be exploited at a later stage.

The improvements will lead to better utilisation of staff by operating a standardised and simple material flow system. That is an enormous saving when added to the gains the UHB has seen from Transforming Care.

Trays showing Min/Max and potential for Barcode (figure 2)



Propose a 2 bin approach (where ward stocks have two segregated items of the same product in the same shelf and use this to visually trigger re-supply).

The ward teams must begin the improvement process and start the initiative. This will allow the IT teams and the logistics personnel to work together to redesign the ultimate system and also will allow time for software vendors to make changes. These changes could be a design freeze for a year as a new system is tested and we have the window of one year to prepare ourselves.

IMPACT ASSESSMENT

Health Improvement	Delivery of recommendations that consumables are in the right place at the right time for patients
Workforce	The report will ensure that there is full staff involvement in service redesign
Education and Training	N/A
Financial	The recommendations will improve efficiency and resource utilisation
Legal	Ensure compliance with Contracts with WHS and NHS Supplies
Equality	The report will help to ensure that UHB complies with equality legislation and ensure that services are delivered in an equitable manner relative to need and disability
Environmental	Shelving within the ward and stores area redesigned

RISK ASSESSMENT

Clinical/Service	The proposed pilot will require a risk assessment before commencement and will create an opportunity to improve quality of care and patient safety not realised if improvement actions are not implemented
Financial	Mapping the demand of the services and ensuring adequate supplies are available prior to changes in service provision and an opportunity to improve resource utilisation
Reputational	The success of the pilot will ensure sustainability when this is rolled out to other clinical areas.

	Service redesign will aim to ensure confidence within the supply chain for clinical managers.
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Acronyms and abbreviations	UHB – Cardiff and Vale University Health Board IT – Information Technology ADC – Automatic Data Capture EDC – Electronic Data Capture CSSD – Central Sterile Services Department OD – Organisation Development RTTC – Releasing Time to Care
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CONSULTATION AND ENGAGEMENT

Engage with stakeholders within the supply chain i.e. managers and staff from Purchasing and Stores services. Voice of the customer from ward managers at UHW and Llandough. Linked with main suppliers Welsh Health Supplies and NHS Supplies.

SOURCES OF INFORMATION

Feasibility study conducted May 2010 to August 2010 at UHW site and partially at Llandough.

University of Bath Report by Lewis et al 2009, Welsh Assembly Government