RFID Case Study

Orthopaedics RFID Application for “Loaner Set” Logistics

HIBCC Auto-ID Technical Committee
19 January 2006

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The orthopaedics products supply chain

- Product types includes:
  - Implants for joint surgery – eg artificial knees and hips
  - Trauma products. Typically for car accident and similar injuries. Plates, rods, screws etc.
  - Spinal injury products

- Products are typically supplied as:
  - Consignment stock
  - Loan set arrangements

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Consignment Stock

- Products warehoused at the hospital, and owned by the supplier until they are used.
- Typically stored within operating room stores, or CSSD
- Products are invoiced by the supplier following usage of a product
- High degree of traceability required
- Replenishment is based on usage. Typically replenished following the reported usage by the hospital

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Loan Set Business Model

• **Surgeon books a loan set for a specific patient procedure with the hospital**

• **Loan set includes:**
  - Sterile implants – full set of implants including all sizes.
  - Set-up implants (templates) for sizing during surgical procedure
  - Non-Sterile implants – screws and other similar components used to “fix” the implant to the patient
  - Non-sterile surgical instruments necessary to perform the procedure

• **Surgeon performs procedure within hospital, uses the right size implants, and returns loan set including instruments and un-used implants to the supplier.**
Current Logistics for Loan Sets - Booking

Loan set booked by surgeon

Supplier puts together loan set, scans primary and secondary barcodes on all implants

Bill of materials for loan set created

Loan Set Shipped

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Current Logistics for Loan Sets - Hospital

Hospital receives loan set (usually in CSSD or operating room stores)

Removes non-sterile instruments, and puts through sterilization process

Once instruments sterilized, loan set including instruments and implants put together again, and delivered to operating room for surgery

Surgical procedure performed, scout nurse captures products used, including the lot numbers

Hospital returns loan set to supplier

Sends PO to supplier for implants used. Includes lot numbers, surgeon and MRN for patient

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### ACT Health Supply Services

**PO Box 47 Mitchell ACT 2611**

**Purchase Order**

**ABN:** 82 049 056 234

Department of Health and Community Care

**(DUPLICATE)**

**Purchase Order No:** 541127

**ACCOUNT NO:** 1ACT2606

Please quote this number on all deliveries and invoices.

Please supply the undersigned goods/services in accordance with the attached terms and conditions.

**DELIVER TO:**

The Canberra Hospital Supply Receiving Dock
Gilmore Crescent, GARRAN, ACT

2005

**To Supplier:**

STRYKER AUSTRALIA P/L
UNIT 58, 2A HERBERT STREET, ST LEONARDS, NSW 2065

**Supplier Contact:**

Contact Fax: 0294671110

Note to the supplier:

<table>
<thead>
<tr>
<th>Line No</th>
<th>Order Qty</th>
<th>Sell Unit</th>
<th>Item/Service Description</th>
<th>Supplier Cat No.</th>
<th>Unit Price</th>
<th>GST</th>
<th>Total (excl GST)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>EACH</td>
<td>EXETER FEMORAL STEM NUMBER 0500-1-002 2.50MM</td>
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<tr>
<td>2</td>
<td>1</td>
<td>EACH</td>
<td>INTERMEDIATE PLUG 14MM</td>
<td>0938-0-114</td>
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<tr>
<td>3</td>
<td>1</td>
<td>EACH</td>
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<td>542-11-66</td>
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<tr>
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<td>1</td>
<td>EACH</td>
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<td>FREIGHT*</td>
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</tbody>
</table>

Comments:

- Patient: 369030 Lot: G10297600E7004 Dr Smith Procedure Date: 23-Sep-2005 Consignment Replace
- Patient: 369030 Lot: F51T2L2386 Dr Smith Procedure Date: 23-Sep-2005 Consignment Replace
- Patient: 369030 Lot: 13666201 Dr Smith Procedure Date: 23-Sep-2005 Consignment Replace
- Patient: 369030 Lot: 14611101 Dr Smith Procedure Date: 23-Sep-2005 Consignment Replace
- Patient: 369030 Lot: G1235399F6D003 Dr Smith Procedure Date: 23-Sep-2005 Consignment Replace

**Date of Order:** 29/09/05

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Current Logistics for Loan Sets – Returned Loan Sets

Supplier receives returned loan sets.

Barcode scans implants remaining in loan sets. Verifies that all instruments are returned.

Determines by deduction implants used by the hospital, puts away unused implants in warehouse to make available

Receives PO from hospital, and reconciles against their records of consumption based on what was returned

Sends invoice to hospital. Resolves any discrepancies.

Gets paid

Time consuming. Takes typical large supplier an entire day to process returned loan sets from previous day

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RFID enabled process

Supplier attaches RFID tag to box of every implant. Magellan Stack Tags – 13.56MHz

Creates serialized HIBC number, and codes to RFID tag. Relates this serialized number to the primary and secondary barcode in the database.

Reads all RFID tags on implants in loan set by putting through Magellan Tunnel Readers (booking out and returned loan sets).

Scans primary and secondary HIBC barcodes

101025SLHH124000001

AFI
Access Method
DI for serial number
LIC
AIC for HIBCC
Serial No

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What are the benefits?

- **Significant Productivity Improvement**
- **Significant Reduction in inventory held**
- **Reduction in working capital = increased profitability**
- **Improved traceability**
Current Challenges

- Tracking of Non-Sterile Surgical Instruments and implants – very challenging:
  - Metal surface
  - High temperatures of the Autoclave
  - Small surface area – requires very small tags in some instances

- If this problem can be solved – very valuable!!
**MEMS is a possible Solution**

**RFID chip - CMOS vs MEMS**

<table>
<thead>
<tr>
<th></th>
<th>EXISTING RFID TECHNOLOGY</th>
<th>Mems-ID RFID TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RFID Chip</strong></td>
<td>Microelectronic integrated circuits (ICs)</td>
<td>Mems-ID chip</td>
</tr>
<tr>
<td><strong>Manufacturing approach</strong></td>
<td>CMOS → mature technology</td>
<td>MEMS → disruptive technology</td>
</tr>
<tr>
<td><strong>Manufacturing requires:</strong></td>
<td>- Processing steps - Equipment</td>
<td>- Processing steps - Equipment</td>
</tr>
<tr>
<td></td>
<td>10 – 20 masks Expensive ultra high vacuum equipment</td>
<td>3 – 4 masks Lower cost processing equipment</td>
</tr>
<tr>
<td><strong>Cost of RFID chip</strong></td>
<td>Relatively expensive &gt; US $0.12 - $2.00 (high volume)</td>
<td>Low-cost &lt; US $0.01 - $0.05 (high volume)</td>
</tr>
<tr>
<td><strong>Applications</strong></td>
<td>Expensive items or on pallets</td>
<td>Individual items and cartons</td>
</tr>
</tbody>
</table>

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Value proposition of MEMS

- **Integrated functionality into a single chip**
  - Sensor capability – temperature and thaw indication
  - Security features – similar to electronic article surveillance (EAS)

- **Ability to withstand high temperatures and irradiation**
  - Easily withstand the high autoclaving temperatures and/or irradiation steps needed for modern sterilization procedures without the need for additional costly protection packaging

- **Small Chip Size**
  - Directly embedded into product
Questions?