The Bendigo Health DMR form journey

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This article outlines the journey Bendigo Health (BH) is undertaking to transition from a paper-based patient medical record to a DMR, which includes both scanned and e-forms.

Background

In January 2017, a new $630 million Bendigo Hospital will be opened. One of the key features of the new hospital’s design is its ability to be ‘paper light’. BH planned for an EMR to be implemented with the move to the new building; however, the timeframe for implementation of this technology was considered too short. To ensure the new hospital would meet its ‘paper light’ requirements, a decision was made to tender for an Enterprise Content Management (ECM) solution in isolation from the EMR tender, as a risk mitigation strategy. The DMR is a component of the ECM solution.

The successful ECM tender was awarded to IC3 by Slainte Healthcare and Data Capture Experts, with the contract signed in March 2015. The clinical component of the IC3 solution included:

- Design and development of 175 electronic forms applications (e-forms apps), which encompass the majority of clinical processes including assessments and care pathways. These e-forms will be used in conjunction with 175 paper-based forms, which will be templated for automatic classification by the scanning technology (KOFAX).
  - An e-form app, is one-to-many paper-based forms with overlay of form controls to enable electronic capture of clinical documentation, with the addition of business rules to aid workflow processes.
  - Templating is the process of configuring the scanning technology to recognize fields on a form to enable automatic form classification without manual interaction with the system.
- The Vitro Chartbook is the DMR for each patient where the e-form apps and scanned paper-based forms are all displayed in one view.

Discovery and selection of forms for the DMR

After the contract was signed, the process of selecting the forms to be created as either e-forms or scanned forms commenced. The EMR and Health Information Service (HIS) teams engaged with clinical stakeholders from the Clinical Forms Sub-committee and other key stakeholders to initiate dialogue on the forms to be considered for e-forms and/or scanned forms in the BH DMR.

To assist in this process, the EMR team utilised two previously collected datasets as the basis of information outlining current documents used within BH. This information was essential when meeting with stakeholders.

- The first dataset was the 2013 Stocktake of Forms. This process, undertaken by the HIS and EMR project team, involved capturing all documents in use across all clinical departments at BH. The collection of documents included official and unofficial clinical forms, stickers, checklists, and patient education material.
- The second dataset was the 2014 Business Process Mapping work undertaken by EMR project officers. This second dataset mapped ‘current state’ clinical business processes and workflows (approximately 670 in total), which included documents used within the specific processes.

These two datasets provided an understanding of the forms usage across clinical departments. The information was compiled and used as the basis for structured stakeholder consultation on forms. During these consultations information was validated and additional information collected. This additional information included confirmation of forms in use as gathered from the datasets, additional forms in use that had been missed, frequency of the use of each form within that department, and whether modifications were required to the existing version of that form. The collated information from the consultations informed the decision on the selection of forms most suitable for development into e-forms. The decision was based on forms identified as:

- high volume use in one or many clinical departments
- high frequency forms that were in use across multiple departments, and
- forms that clinical areas deemed to be high risk due to documentation of sensitive information.

These forms were then analysed across the patient journey for any gaps. The list of forms to be converted into e-forms and forms for scanning were submitted for feedback and approval via the Clinical Forms Sub-committee. On completion of this process, final approval from the Health Information Systems and Standards Committee (HISS) was obtained. The next step for BH was the preparation of forms for scanning and e-form app generation.
Preparing for scanning of forms

The forms identified for scanning underwent a further process to ensure the design of the forms would meet scanning requirements. Using the Australian Standard (AS) 2828.1, AS 2828.2, as well as vendor system requirements as guidance, it was determined that the most efficient way of classifying our forms was via the use of three barcode identifiers on the form. Optical Character Recognition (OCR) technology and confidence levels may be used for some forms where all of these barcode identifiers are not available. The three barcode method included a form ID embedded into the form barcode, a patient identification (ID) and an episode ID, both of which are patient specific and embedded into the Bradmar label barcode. During this stage, a number of processes were undertaken:

- **Form design:** The EMR and HIS teams ensured that when making unofficial forms into the official format, AS2828.1 and AS2828.2 were reflected, including the use of an ID barcode. BH worked with the graphic designer to ensure each form had an appropriate ‘form ID’ barcode.

- **Patient ID label:** The requirement to capture episode ID on our Bradmar label resulted in the need to redesign our current label to include the relevant episode ID from our patient administrative system (PAS), iPM.

- **Templating:** The process of configuring the scanning technology to automatically classify a form by reading the form ID barcode to identify the form, reading the Bradmar label to identify the patient ID and episode ID to determine who the form belongs to and the relevant episode. The system then extracts this necessary information, and sends the form pdf and metadata to Vitro Chartbook, where it is electronically filed. The vendor templated 175 forms, with the remaining forms to be templated by BH HIS Department.

E-forms development

One of the procured solution’s components (Vitro by Slainte Healthcare) uses an overlay method for the e-form apps. The method uses the current paper-based form in a pdf format as the background image for the e-form and overlays form controls to capture the clinical documentation electronically. During this stage, a number of processes were undertaken:

- **Form design:** The EMR and HIS teams ensured that when making unofficial forms into official format that AS2828.1 and AS2828.2 were reflected, including the use of an ID barcode. BH worked with the graphic designer to ensure the medical record (MR) pdf proofs created.

- **Workshops:** After pdfs of the forms were collated, the Form Design Workshops commenced. During these workshops the EMR Project Team, in conjunction with the vendor and clinical stakeholders, reviewed the use of the form in its current state. This included discussion of the types of clinicians using the form (e.g. doctors, nurses, pharmacists), when and where the clinical documentation is captured, and the flow of the documentation. Discussions yielded vital information on how best to capture this clinical documentation in electronic format, with the overlay of form controls. The form control options available to the clinical users included, but were not limited to: dropdown boxes, free text, date and time pickers, database look-ups, integration of information from the PAS, and auto population from other e-forms created in that episode.

- **Form changes:** Review of each field on a form during the workshops highlighted inconsistencies between similar forms and poor documentation flow. As a result of these reviews a large proportion of forms, approximately 75%, required changes. These changes were completed in consultation with the clinical form owners, relevant committees, (including the Clinical Forms Sub-Committee), HIS and the EMR project teams. Changes were finalised with the graphic designer and the form re-submitted to the vendor.

- **App specifications:** Each e-form app had an app specification document written that was reflective of the individual form controls selected, relevant values and the business rules for each form. The app specifications were created by the vendor, then reviewed and approved by the EMR project team.

- **App development:** The vendor used the app specifications to create the e-form.

- **App review workshops:** Clinical form owners reviewed the e-form to ensure the form controls and business rules met their clinical documentation and workflow requirements. By providing the clinical form owners the opportunity to make changes to the preselected form controls and business logic, any issues could be resolved prior to the form moving through to the next stages of the project. The next stages of the project involved system testing and user acceptance testing.
### Table 1: Structure of the Master Form Register

<table>
<thead>
<tr>
<th>COLUMN/TITLE</th>
<th>GUIDE FOR USE OF COLUMN</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form ID (MR No.)</td>
<td>Unique Form ID for each form</td>
<td>MR125</td>
</tr>
<tr>
<td>Title of form</td>
<td>Full title as it appears on the form</td>
<td>Resuscitation Chart</td>
</tr>
<tr>
<td>Barcode</td>
<td>Barcode allocated to the form. Please note: this barcode will only appear on Bendigo Health (locally) developed forms.</td>
<td>FBH 419 000</td>
</tr>
<tr>
<td>Pantone stripe</td>
<td>The colour stripe/pattern on the first page of the form that also lists the form title and the Form ID.</td>
<td>Blue and White</td>
</tr>
<tr>
<td>Event Set Hierarchy (ESH) Section (Dividers)</td>
<td>The divider under which the relevant forms for that section are positioned. Each ESH section may have varying assembling or business rules.</td>
<td>Accident &amp; Emergency (A&amp;E)</td>
</tr>
<tr>
<td>Category</td>
<td>The naming convention used to group similar types of forms for the selection and filtering of forms.</td>
<td>Observation Charts</td>
</tr>
<tr>
<td>Forms Sits in Multiple ESH Sections</td>
<td>Indicates whether the form is used and filed in more than one section. If a form sits in more than one ESH section, the business rules for filing will provide the filing requirements for that instance of the form in green font colour.</td>
<td>Yes</td>
</tr>
<tr>
<td>Label Types</td>
<td>Indicates the type of label/s that may be affixed to the form. Where a form is indicated as sitting in multiple ESH sections, the Label Type will indicate the relevant label type for that instance of the form in green font colour.</td>
<td>Inpatient, Emergency</td>
</tr>
<tr>
<td>Business Rules for Filing</td>
<td>Indicates the filing rule for the form. Where a form is indicated as sitting in multiple ESH sections, the business rules for filing will indicate the relevant filing rule for that instance of the form in green font colour.</td>
<td>If Inpatient label, file in Inpatient section. If Emergency label, file in A&amp;E section.</td>
</tr>
<tr>
<td>Form Status</td>
<td>Indicates the method the DMR system will use to capture the form.</td>
<td>Scanning Only</td>
</tr>
<tr>
<td>Size</td>
<td>Indicates the size of the form in paper-based format.</td>
<td>A4</td>
</tr>
<tr>
<td>Duplex/Simplex</td>
<td>Indicates whether the form has been designed for clinical documentation on one side of the paper-based form (Simplex) or for clinical documentation on two-sides of the form (Duplex).</td>
<td>Duplex</td>
</tr>
<tr>
<td>Type</td>
<td>Indicates whether the form is a locally developed form, statewide form or developed by other avenues.</td>
<td>Local</td>
</tr>
<tr>
<td>Printer Company</td>
<td>The company used for the graphic design and print of the paper-based form.</td>
<td>Local Printer</td>
</tr>
<tr>
<td>Approval Status</td>
<td>The status of where that form is up to in the approval process.</td>
<td>Approved</td>
</tr>
<tr>
<td>Last Revised Date</td>
<td>The date as noted on the form as last revised.</td>
<td>June 2012</td>
</tr>
<tr>
<td>Comments</td>
<td>General commentary on the form.</td>
<td></td>
</tr>
</tbody>
</table>
**Single clinical user interface**
The technology that BH procured enables scanned images and e-forms to be displayed in one clinical user interface, with the ability to configure the ‘filing’ of forms as BH requires. BH mimicked the setup of the Vitro Chartbook to match the paper based file, with a few minor improvements, to assist in the transition to a DMR and decrease the impact of change for our end users. As a result, a Master Forms Register was developed to configure the set up and to manage forms moving forward.

**Process for creating the Master Forms Register**
- **Pre-existing HIS forms list:** This included review of the existing form list, removing any superseded or rescinded forms, removing any forms not part of the acute medical record and ensuring the barcode allocated to each form was consistent with the graphically designed paper form.
- **Consultation with other HIMs:** Feedback was sought from the Victorian Chief HIM Group to gain insight into the industry standard with regards to a medical record structure (paper or digitised) in use in Victorian hospitals.
- **Consultation with clinical stakeholders:** Extensive engagement was undertaken with clinical stakeholders to ensure changes to current Event Set Hierarchy (ESH) would meet their needs, be supported by end-users and would comply with National Safety and Quality Health Service standards.
- **Committee approval:** A paper for the proposed ESH for the Vitro Chartbook was written and disseminated for feedback and approval via the Clinical Forms Sub-Committee. On receipt and compilation of feedback, final approval from the HISS was received.
- **Master Forms Register:** This included designing the template/structure of the register (as outlined in Table 1) and completing the content of the register, including the development of categories and business rules for electronic filing.
- **Establish rules for use and management:** Once the register was developed, the decision on who would require view access and who would manage the register was determined. The decision would assist in ensuring the integrity of the dataset and its maintenance.

**Recommendations from the lessons learnt by BH**
- Start your forms discovery (document and data collection) work as soon as possible, including the development of a Master Forms Register. BH recommends commencing the work before or during the tender process.
- Invest time early in the discovery and analysis of how your PAS system will be able to extract and display an episode level ID onto the form.
- Engage a graphic designer who will give a priority service for creating pdf proofs of official forms.
- Never underestimate the positive impact of a formalised clinical forms committee. A multidisciplinary forms committee provides a governance structure to underpin the development, review and approval of clinical forms and form policies.
- Ensure there is strong clinical engagement and extensive consultation with clinical stakeholders. Securing stakeholder engagement early, and throughout the project, supports and enables informed decision making and ultimately results in ownership from clinical end users during implementation and go live.

BH plans to go live with IC3 in mid-2016, approximately six months prior to the opening of the new ‘paper light’ hospital.

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