

Kidney Advisory Group
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Electronic “Form A” and “Form B”

There have been longstanding calls for an electronic replacement for the HTA Form A and Form B, a concept which was widely supported at last year’s Clinical Retrieval Forum in London. The potential advantages include:

- improving data capture
- validating the reporting of retrieval injury and other anomalies
- providing more rapid feedback to retrieval surgeons as part of a robust quality cycle
- reducing the burden of form completion by eliminating duplicated data vs multiple paper forms

The Netherlands uses a system of electronic forms with the implanting surgeon’s assessment of the organ directly compared to the retrieval surgeon’s, which can then be used to provide robust performance data for quality control and to guide training. This system would meet many of the needs identified by the UK transplant community, but would need some modification.

Prototype of the interface

A prototype of the interface has been built and can be previewed at www.txttools.net/odtpilot/ but it is still very much under construction so please bear with anything that is not yet working! So far there is only an interface, as the more complex backend functions will have to be designed based on expertise available in NHSBT IT or on the resources available to contract it out. If prompted for a login and password, please use “nors1” to “nors6” or “norslead1” to “norslead6” as the username and “nors” as the password to sign on as one of the fictitious surgeons or unit leads.

At the time of writing, you can enter data on the abdominal organ forms although nothing will happen when clicking the “submit form” button, so please feel free to play around with the forms.

The form is designed to minimise the work required for form completion by automatically populating fields from the database whenever possible and by hiding fields until they become relevant. For example, the basic view of the kidney-specific fields is:

Kidney details		
	Left kidney	Right kidney
Time in ice bowl	--:--	--:--
Machine perfused?	No	No
Biopsy taken	No	No
Anatomy normal?	Yes	Yes
Pathology?	No	No
Damage?	No	No
Vein branches tied?	No	No
Perfusion quality	Good	Good

If any of the options for machine perfusion, biopsy, abnormal anatomy, pathology or damage are selected, additional fields appear to capture specific information. For example, if damage is selected:

Kidney details		
	Left kidney	Right kidney
Time in ice bowl	<input type="text" value="---:--"/>	<input type="text" value="---:--"/>
Machine perfused?	<input type="text" value="No"/>	<input type="text" value="No"/>
Biopsy taken	<input type="text" value="No"/>	<input type="text" value="No"/>
Anatomy normal?	<input type="text" value="Yes"/>	<input type="text" value="Yes"/>
Pathology?	<input type="text" value="No"/>	<input type="text" value="No"/>
Damage?	<input type="text" value="Yes"/>	<input type="text" value="No"/>
Arterial anatomy and status		
Cut to artery	<input type="text" value="No"/>	
Complete transection	<input type="text" value="No"/>	
Artery cut off patch	<input type="text" value="No"/>	
Artery comment	<input type="text"/>	<input type="text"/>
Venous anatomy and status		

Using this approach it should be able to capture more detail than currently as the detail will only be requested when relevant. For example, if "Pathology" is changed to yes, the additional fields that appear include one for "Cysts", and if this is selected then additional fields appear to further characterise the cysts.

There are form validation methods built in to HTML5 which can be enhanced using JavaScript to flag any anomalies before the form is submitted, and thus reduce the workload of the transplant support services at ODT as well as that of the NORS and transplant centres responding to their queries.

The page to view a completed Form A, which would be used by the surgeon who had accepted an organ for transplant is at the time of writing under construction but most of the kidney view is complete. Form B is similarly only partially built and only for kidneys so far.

The back-end of the electronic forms web application uses a MySQL relational database and so far has tables built for donors, retrievals, surgeons and kidneys. These tables have been populated with details of fictitious patients, surgeons and hospitals.

The list of current retrieval and organ-specific variables for the abdominal organs is in the attached Excel file. The dataset for cardiothoracic organs and vascularised composite allografts is yet to be developed.

The interface has been built with the intention that it should be usable on both desktop PCs and mobile devices. It has been tested on Windows and Linux desktop browsers, including the now ancient Internet Explorer 8 which is still used in most NHS computers, as well as on an Android phone and tablet, an iPhone and an iPad mini.

Functional structure



Additional scripts can be added to the application to generate statistics in real time for NORS centres, using customisable standard queries of the application database. This could include numbers of retrievals and damage rates and could be presented compared with all other centres over the selected time period.

It may also be possible to generate a surgical logbook for retrieval surgeons using the database, but it may not be possible to link this directly to other electronic logbooks like eLogbook or the Surgeons Portfolio (although I could approach the Faculty of Health Informatics at the RCSEd to explore the options if such a link would be considered desirable by the retrieval surgical community).

Taking this further

Rutger Ploeg has set up a functionality working group to determine what we require from a new system to meet clinical, training, quality assurance, statistical and statutory reporting (HTA) needs. In particular it is essential that the new dataset contains fields that can be mapped to the fields in NTxD on a one-to-one basis and that the requirements laid down by the HTA are met, although additional fields beyond that minimum requirement are of course also possible.

The system used in The Netherlands is based on an Oracle database using the Oracle ADF framework, which is based on Java. The existing NTxD is based on Oracle, and EOSmobile uses Java Server Pages, so there may already be sufficient expertise available either in house or via Sapient, the EOSmobile developer.

The current prototype site uses PHP scripts to interface with the MySQL database, which like Oracle can be queried with standard SQL, so portability to Oracle should be achievable. The actual interface pages primarily consist of standard HTML5 with JavaScript and jQuery, which are all compatible with any web server platform.

A working electronic forms application requires additional features such as the capability for offline working, robust security for the scripts to prevent issues such as SQL injection attacks, secure login and authentication methods to allow digital signing and the ability to generate PDF files.

The client-side scripting language JavaScript and its jQuery libraries can provide fairly good calculation and data presentation tools, but more sophisticated data analyses such as CUSUM charts or funnel plots would need additional tools. Shiny (<http://shiny.rstudio.com/>) is a web application framework that can process scripts using the R statistics language and its associated packages and is available both commercially and as a free open source app but it is not clear whether we have the resources to implement this; however, real time CUSUM and funnel plots do strike me as desirable rather than essential features.

Making this into a working reality will require resources, probably from the external commercial sector, and these are not currently funded. There may be additional capital costs in providing SNODs with portable printers, which are also unfunded. Once we have established what is required and wanted by the transplant community it will be possible to determine the requirements and develop a business case to go through the appropriate channels

What is needed now are your views on the following issues:

- Do you like the format? What aspects do you like or dislike about the interface?
- Is the dataset correct for your organs of interest? What else should be there, or not?
- Which features do you consider essential, desirable and unnecessary?
- How will the essential and desirable features change your practice and training arrangements?
- Do you think these forms will improve outcomes?

John Asher

National Clinical Lead for Health Informatics, ODT