

Enhancing effective use of data: Development of a web-based Patient Safety and Quality Improvement Meta data (PSAQIM).

Authors:

Dr Navila Talib Chaudhry – PhD researcher and pharmacist, Centre for Patient Safety and Service Quality, Imperial College London.

Dr Monsey McLeod – Lead Pharmacist, Medication Safety and Anti-infectives Research, Centre for Medication Safety and Service Quality, Pharmacy Department, Charing Cross Hospital, Imperial College Healthcare NHS Trust.

Dr Sara Garfield – Researcher, Medication Safety and Anti-infectives Research, Centre for Medication Safety and Service Quality, Pharmacy Department, Charing Cross Hospital, Imperial College Healthcare NHS Trust.

Mr Anthony Thomas – Data manager, Imperial College London NHS Trust.

Professor Bryony Dean Franklin – Executive Lead Pharmacist Research & Director, Centre for Medication Safety and Service Quality, Imperial College Healthcare NHS Trust.

Dr Jonathan Benn – Quality improvement lecturer, Patient Safety and Translational Research Centre, Imperial College London.

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The development of a Patient Safety and Quality Improvement Meta data (PSAQIM) resource.

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Executive Summary:

A vast variety of electronic systems exist within the NHS, with various different levels of data. The use of existing data could be a method of enhancing patient safety and quality of care in secondary care. To date there has been little focus from the clinical frontline perspective on the tools to support effective re-use of data for enhancing quality improvement and safety. The potential to enhance healthcare professionals knowledge, uniformalise the process of accessing data, producing a clear and concise method to explore the types of information available within the trust and producing a platform for healthcare professionals to feedback and provide further support to each other for reuse of data was explored through the production of a meta-data tool prototype. To fully understand the factors that impacted healthcare professionals in reusing data and what their requirements were to enhance reuse of data, interviews were performed with a wide range of healthcare professionals until data saturation was reached. Based on the inductive thematic analysis performed by two researchers (to reduce the risk of bias), a set of specification was produced that was fully embedded within the evidence base found through the qualitative work. The evidence based specification helped produce the user personas, then both the user personas and the specification were used as the foundation to build a meta-data prototype that met the requirements of the potential users (i.e. healthcare professionals within the trust). A small scale prototype evaluation was then conducted using specific roles to test the system to ensure it could be easily integrated into a large trust and met the overall requirements as elicited through the qualitative data.

Implications for development of a meta-data tool - qualitative interviews summary of results:

- The main three sub themes that emerged were: **access of data** (and the barriers), **working with others** and the **organisational issues** (e.g. information governance and time constraint) that require consideration.
- The current undefined processes of secondary use of data within the Trust can result in a difficult and long procedure to gain access to data (this sometimes requires ethics which needs consideration).
- Key barriers that arose were what data is available, how to gain access (process of gaining access), knowing who to contact to access data, owner of the systems, requests for data retrieval and provide further information on the data that exists.
- Electronic data was deemed to be easier for reuse but it was thought the following things would make secondary use of data easier: if everything was available on one system and the system was self-explanatory. Technology therefore is a limiting factor and needs to be considered as it can be a barrier, however you also need to understand how to best reuse this data and individuals envisaged repurposing data to be difficult.
- There were three main sub themes identified within users' knowledge which would impact their ability to reuse existing electronic data: the knowledge of the data available, location of the data in the databases and knowledge of how to use existing systems.
 - The users' knowledge of the data available was perceived to be critical step in reusing existing electronic data.
 - There was no defined method of identifying existing electronic systems and it was described as a time consuming and complex task to identify existing electronic systems.
 - Some individuals thought theoretically it was easy but practically difficult to identify existing electronic systems.

The summary above provides an overview of the importance of a meta-data tool and its potential functionality. The prototype developed had various guidance and functionality to meet the requirements of the users and this included the following:

- Clearly stating the aim of the prototype (i.e. why it should be used),
- Various methods of searching for databases (alphabetically or based on a search term),
- Providing further information regarding reuse of data, the steps involved and further guidance on how to complete each step and move forward,
- Identify the list of databases that are already accessible by the individual using the system therefore the home page is personalised based on each user log in and the database available to them will be specific to their job role,
- Providing information on essential resources that can guide on how to reuse data for quality improvement and the potential factors to consider in relation to improvement science. Hence, providing a starting point for individuals on how to reuse data and the factors to consider when doing so for improvement purposes,
- Providing a platform for individuals to share information on how they have reused certain data types and based on the purpose of data reuse they rate the usefulness of the data,
- To identify a list of relevant databases based on searches, with information on each database, the number of records in each database, whether it is linked or not, sorting the results of a database search in the tool based on different factors and being able to filter searches on databases based on various factors,
- Being able to quick view information on each database and apply for access if needed while seeing the reviews of the past users,
- Seeing detailed information (i.e. location of database, users, security level, database owner and contact details), user reviews on the data, purposes for which database was used (i.e. secondary purposes), primary purpose of database, the department it belongs too, the fields of data available within the database, type of file (e.g. excel format) and the level of information available e.g. patient sensitive or not.
- Review and comments section for users to place information for other users to help guide them on the data they may wish to use.

A small scale evaluation was conducted to help understand whether the prototype design was sufficient and met the requirements or whether further work was required to ensure the tool met the standards of potential users from various healthcare professional groups. The evaluation provided positive feedback with minor potential changes that could be made if needed. However, majority of the reviews were positive and the tool in its current state could be implemented across site to enhance data reuse based on its easy design and simple yet self-explanatory functionality.

The main contribution of this project was to conduct a comprehensive analysis of requirements for such a tool, from the end-user's perspective, and to illustrate how such a tool might be implemented, using a requirements-driven, rapid iterative prototyping approach. The end result demonstrates the feasibility of a simple, implementable, user-focused solution that will integrate with existing information asset databases to fully leverage the value of routinely collected data in healthcare organisations to enhance patient care.

1. Background

A wealth of information systems containing potentially useful information for patient safety and quality improvement exist within Imperial College Healthcare NHS Trust (ICHT). These include the infection control monitoring system and the pharmacy medication dispensing and stock maintenance system among many others. However, information about these systems, what data they contain and how they can be accessed is limited and typically only known by regular users. A trust Information asset register (IAR) is available but it requires the user to have knowledge of what systems currently exist rather than allowing users with no prior knowledge to find out what information exists and where/how it may be accessed to support review and monitoring of patient care and quality improvement. This presents a potential missed opportunity to improve front-line staff awareness of the data sources available in the trust that could support more effective secondary use of existing data. In addition, healthcare trusts invest heavily in information systems and databases to support routine operations, yet the potential for effective re-use of existing information assets to support healthcare professionals in enhancing patient safety and quality of care is yet to be realised.

A meta-data prototype that provides information about the existing data available and enforces a synonymous process for all healthcare professionals to follow may be a potentially cost effective process in enhancing reuse of data to support quality and safety of patient care. A meta-data resource could potentially address the issue around users' lack of data knowledge. "Meta-data" refers to the descriptive and practical information about a dataset, rather than the actual data itself. This type of tool helps provide stakeholders with the relevant information around data that exists and an integrated tool could be a good starting point for getting the answers to questions around access, content and potential applications of relevant datasets.

Each secondary care organisation varies in processes, structure, and services; hence the potential factors influencing secondary use of data may differ too. Therefore, it is important to identify the barriers users are facing in trying to identify, access, and reuse existing electronic data in the NHS Trust within which the Patient Safety and Quality Improvement and Meta-data (PSAQIM) tool will be implemented. Information regarding the data that exists within the organisation and the reasons for which data is being reused by healthcare professionals and researchers should be identified, in order to produce a tool that presents information about existing electronic databases within the organisation concerned. The information users require in order to reuse data should be explored in order to answer the questions they have and present them with the information they require in a simple manner. However, from the users' perspective, the process of granting access should be made simple and easy (a role that is commonly dealt with by the ICT team).

Therefore, qualitative interviews and a proof of concept study were conducted in the present study. The former explored the barriers and facilitators for SUD, and requirements for the meta-data tool from the perspectives of healthcare professionals and researchers who wish to reuse data. The latter then included development and evaluation of a meta-data prototype based on the user requirements identified through the qualitative interviews.

2. Aims and objectives

Our aim was to identify current information available within the trust and facilitate the secondary use of this information to support patient safety and quality improvement through development of a

web-based resource. The objectives below are addressed in the two different sections (A and B). Specific objectives were:

1. To confirm the relevant databases available within the trust and the information they hold to facilitate secondary use of existing data by trust staff (section A).
2. To identify stakeholders' needs for data that can be used for patient safety and quality improvement (section A), in order to produce a comprehensive functional requirements specification for the tool development.
3. To explore the barriers and facilitators to the effective secondary use of data for quality improvement (section A).
4. To develop a prototype of a user-friendly website to facilitate secondary use of existing trust data (section B).
5. To evaluate the effect of the prototype website on perceived ease of secondary use of data to support patient safety and quality improvement (section B).

The anticipated benefits for this project included: 1) raising awareness and enhancing secondary use of existing trust data resources to support service improvement, 2) greater return on investment in information technology infrastructure, and 3) reduced duplication of work.

3. Project context

Research and development funding and collaborations

A proposal for this project was submitted to the National Institute for Health Research (NIHR) Imperial Patient Safety and Translational Research Centre (PSTRC) as part of a patient safety call. The PSTRC granted £27,500 for this study and the funding was for staff time, software development, and transcription costs. This work expanded upon another improvement science project funded by The Health Foundation that focused on investigating the secondary use of data to improve the quality and safety of medication use in hospitals. This study for the patient safety call was led by Dr Navila Talib Chaudhry (academic lead) in collaboration with Dr Monsey McLeod (Trust lead), Dr Jonathan Benn (quality improvement lecturer and researcher), and Professor Bryony Dean Franklin (Executive Lead Pharmacist Research & Director, Centre for Medication Safety and Service Quality) with input from Mr Anthony Thomas (data manager), and we collaborated with Dr Sara Garfield (researcher). Collaborations with the Java team and the ICT team from the trust was important to ensure that all aspects were considered in relation to the trusts policies and our study. Akendi - an external developer was contacted and the specifications were highlighted for them to produce a prototype. The ICT team were consulted regarding the prototype and they fed into the functionality and current design to ensure it adhered to the trust guidelines and could easily be integrated in the future.

Limitations of existing meta-data assets and rationale for an improved tool

This study was conducted at two hospital sites that are part of ICHT. The Trust had an IAR that contains the list of all the electronic databases being used within the Trust. The IAR is available for use within the Trust by all trust employees; however, it was not known to what extent healthcare professionals and researchers know about this tool. The primary purpose of the IAR is to help the information communication team (ICT) to keep an account of Trust databases for information governance purposes; the main users are therefore within the ICT department and the design of the

tool and its interface were geared towards use by informatics professionals rather than clinical end-users. It could be argued that the IAR is not a very user-friendly interface, for example, to search for a system, the full name of the system must be known in advance. This is a potential barrier as the individual searching must have knowledge of the databases that exist in order to search for them on the IAR and gather further information about them.

The information held in the IAR about each database is of a basic level, some very technical information that may not be useful for users and some very useful. Examples of the useful information are: whether the system is active or inactive, who is the data owner, and under which department the database is held. Stakeholders may not be able to obtain this detailed information available due to the IAR functionality. In summary, the existing IAR was designed to deliver the trusts obligations for regulation of existing information assets by informatics professionals, rather than to promote and encourage extended re-use of information assets by health care professionals to support safety and quality improvement. Conceivably, a considerable amount of tacit knowledge concerning data collected in the trust, its potential relevance to varied stakeholder groups and potential for service evaluation and development, resides within the many isolated end-user groups that access and work with specific datasets on a regular basis. Existing systems do not capture and share this important knowledge throughout the organisation and constrain the opportunities for live update of meta-data as information assets evolve.

4. Methods

This project had two main phases; the first was an exploratory qualitative interview study to identify the local barriers and facilitators around secondary use of data in a large teaching organisation. The second was the production of a user specification based on the qualitative work and production of the meta-data resource with a small scale evaluation. The methods section has been split into two parts, each corresponding to the respective study.

A potential user-friendly interface in a form of a meta-data resource could be a valuable asset, with the IAR feeding information into it. The proposal of producing an interface (as wireframes [i.e. a mid-fidelity display illustrating the prototypes functionality] – which can be easily altered and adopted by other organisations) that could be placed on top of the IAR was made and accepted; this would allow regular updates on the IAR by the ICT department. This will ensure the system is easily sustainable post completion of this study. A user-led specification was developed and used to ensure user requirements were incorporated within the tools design and functionality to enhance the tool usage and encourage SUD.

Phase 1 - Exploratory qualitative interview study:

A qualitative study was conducted using semi-structured interview questions with individuals who met our inclusion criteria (stated below) and wished to participate. This study was classed as service evaluation by the joint research compliance office at Imperial College London (ICL) and Imperial College Healthcare NHS Trust (ICHT).

Participant inclusion criteria and sampling strategy

The inclusion criteria were that individuals had to be a researcher and/or belong to one of the following professions: doctors, nurses, pharmacists or allied healthcare professionals, had to have experience of secondary use of data; and had to work at ICHT. A purposive sampling strategy was selected to identify these candidates known by the core team of researchers to be involved in quality improvement projects where efforts to reuse data had been made successfully or unsuccessfully. An element of snowball sampling was then used where the participants were asked

whether they knew of any other potential candidates who met our criteria and who may be interested in participating. . Email invitations were sent to potential candidates and reminders were sent twice. To recruit allied healthcare professionals, emails were sent to lead managers of allied healthcare professionals within the Trust. Interviews were then conducted until data saturation was reached.

Qualitative interview question and data collection

The participants were provided with a participant information sheet (appendix 1) and invited to give written consent before participating in the interview. All interviews were conducted face to face and were audio-taped then transcribed externally through a third party. Participants were informed that they had the option of opting out of the study at any time. Pilot interviews were conducted in December 2014, comprising mainly of open-ended semi-structured questions; minor modifications were made after piloting. NC conducted all interviews between January 2015 and April 2015. The final version of the interview topic guide is presented in appendix 1 and includes the following high-level themes:

1. Experience with secondary use of data,
2. Electronic system use,
3. The secondary use of data barriers faced within the Trust,
4. Knowledge of the IAR, and
5. User specification for new meta-data tool.

Data analysis

After the production of the interview transcripts the data were analysed. When analysing data on the participants' experience with secondary use of data, the barriers and user specification for the new meta-data tool, inductive thematic analysis was performed. This approach allowed the data to drive the main themes that emerged through the analysis. The primary researcher analysed 14 (70%) of the interviews, with 9 (45%) analysed by a second independent qualitative researcher (SG). Therefore 3 (15%) interviews were transcribed by both researchers allowing the two to agree on coding structures grouping of key themes. Any discrepancies were resolved through discussion and further defining the coding structure to ensure the themes arising were mutually exclusive and transparent. Deductive analysis was also conducted using the main themes that emerged around barriers, facilitators, and users requirements. These themes were then extracted and added to or highlighted in the coding structure. The key themes identified for the PSAQIM tool production were then used to produce a user specification and a series of user personas – which has been described below in phase 2.

Phase 2 - Production of a meta-data prototype and pilot evaluation:

Production of Meta-data prototype

The stakeholder requirements were set based on the findings of the qualitative study. These requirements were rewritten to provide a clear specification list specifying the functionality, information and layout of the tool that was required (appendix 2). The Trust IT team were contacted and presented with the PSAQIM concept; the requirement specification was presented and discussed. Whether an interface could be added to the IAR to help input data from the IAR onto the PSAQIM tool with supporting information around secondary use of data, quality improvement, and research and a platform for individuals to share their ideas, past experiences, and projects was also

discussed. The ICT team supported the concept and it was determined that the PSAQIM tool could be linked to the IAR to ensure sustainability and allow regular updating. No concerns around information governance were raised.

Akendi, an external web designing team, was contacted who had previously worked with the organisation and selected based on their experience in prototype development, and based on their proven record. User personas were produced and presented to the Akendi team to highlight potential use cases of individuals from different professions and seniority within the Trust wanting to reuse data for various purposes (appendix 3). The information governance team was contacted and their input was gained to ensure that all the information provided on the prototype complied with all the information governance requirements.

The feasibility of providing the level of information stakeholders set as requirements was explored in collaboration with the Trust ICT and Akendi teams, and attempts were made to include all information specified by the stakeholders. The design of the tool, its functionality, and the virtual space for stakeholders to state their feedback on existing electronic systems, their data and the projects conducted required several reviews and iterations to ensure it met the needs of the stakeholders. The Akendi team produced wireframes that were then populated with data from the IAR and further details were added to the wireframes based on the specification. The figures below present examples of screenshots of the tool produced: figure 3 – the home page; figure 4 – a resource page to support and guide users to understand the reasons to reuse data, the process of reusing data, and within each process stage there are suggestions to increase effectiveness and provide resources as PDF documents for further guidance if needed; figure 5 - search result page after searching a term; figure 6 – quick view option of each individual database after clicking the eye sign; figure 7 - information page of each individual database held in IAR; and figure 8 - application form to gain access to data.

Meta-data tool evaluation

Recruitment of participants

The inclusion criteria for the participants in this evaluation were the same as the qualitative interview inclusion criteria specified in the section above. Stakeholders were emailed instructions, a link to an electronic survey, and the tool on 10/10/2016 exploring the tool's design, functionality and the tool's role as part of their job role (appendix 4). The electronic survey link was password-protected to ensure all the information could only be accessed by authorised users within the Trust. Email reminders were sent again on 21/10/2016 and 1/11/2016. The emails were sent across the whole pharmacy department, two research groups and other individuals who showed interest in reviewing the prototype. This wide approach to recruitment meant that it was not possible to calculate a percentage response rate.

Survey development and dissemination

The survey comprised questions regarding the tool's layout, functionality, and whether it met the purpose for which it had been built. The survey comprised questions with an 8-point Likert scale (with 1 as strongly disagree and 8 as strongly agree). The survey was short and concise with the aim of increasing the response rate, and was built using Qualtrics. There was a free text section for respondents to comment on what they thought and how they believed the tool could be improved.

Data analysis

The data was transferred from the Qualtrics database to SPSS v22. Descriptive statistical analysis was then conducted. Any comments made on the free text section were reported verbatim.

5. Project results and outputs

The results section has been split into two main phases (similar to the methods section above). Phase 1 will provide the results of the qualitative interviews and the data elicited from the analysis. Phase 2 has four subsections: subsection one will provide the summary of the key factors identified, subsection two will state the derived specification of the tool from the interview data including the justification of the requirements made based on the interview data analysis, subsection three will demonstrate the tool prototype produced and its functionality, and subsection four will provide the results of the small scale prototype evaluation.

Phase 1: Requirements elicitation – An exploratory interview study

A total of 20 interviews were conducted, with a mean duration of 40 minutes (range 15 to 85 minutes). Interview demographics are presented in table 1.

Table 1: Participant demographics for the PSAQIM case study interviews.

Job role	Number of participants	Gender
Pharmacists	6 participants	4 female and 2 male
Researchers	5 participants	All female
Doctors	4 participants	All male
Nurses	3 participants	1 female and 2 male
Allied health care professionals [occupational therapists]	2 participants	All female

The following results are presented in three sections: (1) actual and potential uses of data for secondary purposes, (2) barriers, facilitators and requirements for secondary use of data, and (3) participant requirements in order to enhance secondary use of data using a meta-data tool. The data analysis around the barriers, facilitators and user requirements further identified three main themes: organisation, technology, and users' knowledge. A summary of the main themes identified can be found in figure 1 and further detail in table 2.

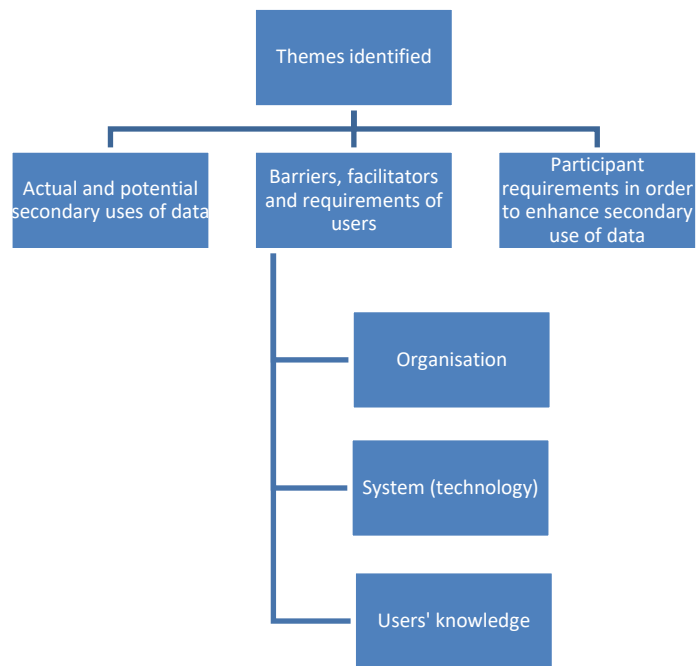


Figure 1: Summary of the different themes and the proposed hierarchical structure of the key themes.

Actual and potential secondary uses of data

There were a variety of secondary use of data purposes identified, these included: monitoring and audit, clinical uses (for example liaising with primary care, and product recalls), research and quality improvement. It was perceived that the data was mainly used for reactive purposes (i.e. where data was used after an event to investigate it); however, majority of the interviews suggested that data was not being used to its full potential. Most participants were of the view that data could potentially be used further to improve patient experience and to categorise patients to explore different research questions.

“Because we collect so much data, and we don’t use almost ... almost half of it to its full potential, we could probably get a lot more out of what we collect than we do.”
Participant 1 [nurse]

“From a research point of view, sort of looking into the future, it would be lovely to be able to pull information out cohort on patients from some of the other clinical systems, to be able to start putting together sort of injury patterns and outcomes and things like that.” Participant 2 [doctor]

Secondary use of data was thought to be a good concept that would make life easier but majority of the respondents highlighted that it was also important to understand the primary purpose behind the data collection.

“Oh I've got a data set, I have no idea how it came about but I will just use it. It probably isn't as robust and it has more limitations and you need to think about that quite markedly.” Participant 3 [occupational therapist]

Barriers, facilitators and requirements of users

Three main themes emerged around the barriers, facilitators and requirements of users: organisation, technology and users' knowledge. Each of these themes is explored in further detail below.

Table 2: Main themes identified through inductive analysis.

High level theme:	Sub-themes
Organisation	Access to data
	Barriers to access
	Organisational issues
	Working with others
Technology	User friendliness of database
	Quality of data (i.e. data accuracy and completeness based on data input)
	Uses of data
Users' knowledge	Knowledge of data available
	Knowledge of how to use existing databases
	Knowledge of which database info will be on
	User categories (stakeholders in organisation)

Organisation

The three main sub themes that emerged under organisation relating to barriers, facilitators and requirements of users were: access of data (and the barriers), working with others and other organisational issues that require consideration. Participants thought that access to relevant existing data was improving within the Trust, some expressed that they had no problems in gaining access to information relevant to their practice. However, accessing data was expressed as a barrier by many participants.

"And so I think that can be quite frustrating when you just want to get on with something and so many sign-offs and information governance and this and that, which I know is important, but I think that can be off-putting for people when they've got to go through so many hurdles..." Participant 4 [researcher]

It was perceived all healthcare professionals should have access to relevant data within the Trust regardless of the location of the data. The interviewees reported that access to data was based on the Trust's culture and processes (i.e. concerns around confidentiality and data security resulting in reduced access to data), as the views of Trust determined whether data would be shared or not (i.e. whether the Trust supports sharing and reuse of data or not). The seniority of the user was perceived to play an important part in gaining access to data.

"And we've had to go through IT to get a report run on the old system, and we've been given a date of like a month away before they can do it. So I'm currently trying to work my way up the food chain to find somebody who'll get it done quicker for me." Participant 5 [pharmacist]

Some participants desired linkage between different systems across different care settings, for example secondary and primary care systems should be linked, allowing access to patients' primary care records.

The current undefined processes of secondary use of data within the Trust was reported to result in difficulty when trying to gain access to data, as this may sometimes require ethics approval. A key barrier was lack of knowledge around what data was available, how to gain access, knowing who to contact to access data, who the owner of the system is, how to request data retrieval, and to provide information on how to access data.

“But never really feeling that I’ve really got the answer because you sort of go round the houses a bit and I don’t really know who to ask.” Participant 7 [researcher]

It became apparent through the analysis that working with others was an important theme. Majority of the participants felt that there was a major reliance on colleagues and senior staff on getting further information about the data that existed as there was no signposting. There was a delay in getting responses to questions asked and sometimes a lack of interest resulting in not getting the right or enough information required.

The number of organisational barriers in place, such as formal approvals and conditions for use of data were perceived to reduce secondary use of data. These barriers were perceived as being important in order to ensure the data is protected and used correctly.

“And if you take away the governance problems associated with it, then I think it’s mainly quality that worries me.” Participant 2 [doctor]

Technology

An important aspect of secondary use of data is the system in which the data is held and how the data may be retrieved; the user friendliness of the system was an important factor for participants that became apparent from the analysis. Interviewees reported that non user-friendly systems exist within the Trust, the initial steps for data reuse were time consuming, but then with experience it becomes easier. It is difficult to change the pre-existing systems, so sometime participants felt that the users had to ‘make do’ with what they had.

“I think I’m quite IT literate and trying to- there’s so much functionality and it kind of makes it, I think, cumbersome and you can learn to get the bits that you need on a regular basis but if you’re going beyond that and trying to find something that you don’t usually need, it can be very challenging.” Participant 2 [doctor]

Electronic data was deemed to be easy for reuse by participants but it was thought the following things would make secondary use of data easier: if information about the data sets that existed within the Trust was available on one system and the system was intuitive to use. Technology therefore is a limiting factor and needs to be considered as it can be a barrier. However, participants believed it was also important to understand how to best reuse this data and this could be challenging given the limited knowledge around how data was collected and data quality. Participants wanted an easy to use system that highlights any variant data points that need to be accounted for based on the analysis performed using the interview data.

The facilitators identified from the analysis were mainly around the data already being present in the systems and participants wanting to reuse it for quality improvement and auditing purposes. Participants felt if the data was accurate, up-to-date, and of good quality it could help form a clear picture to improve the services and care.

“Yeah, I think if we’re happy of the quality of what’s going in then definitely because you can then start to look at things over the longer term which is I think what most of us would like to know is how our patients do over the longer term.” Participant 2 [clinician]

The majority of participants discussed data quality and recognised that data quality would be based on quality of data entry. Data entry and coding influenced the amount of missing data that in turn determined whether the data could be reused or whether further data collection was required. The respondents felt they had to determine: whether the data is quality checked or requires further validation (by the team or a third party, to confirm the data received is in fact correct), how up-to-date the data was, and understand whether the method of primary data collection was in fact valid itself.

“So if the data is made freely available, number one patient confidentiality issues and number two validity of the data as well.” Participant 6 [doctor]

These factors influence the interpretation of the data and if the data is not robust others do not wish to use it. Some participants had a perception that existing data is not fit for reuse as they do not believe in the data they have. Others believed that secondary use of data was powerful as the data captured a wider snapshot of what was happening and the systems had the ability to provide real time powerful data. The usefulness of the data was based on the purpose of reusing the data; participants also wanted to know the original purpose of primary data collection and be clear on the purpose for data reuse.

Users’ Knowledge

There were three main sub themes identified within the theme of users’ knowledge that would impact their ability to reuse existing electronic data: knowledge of what data is available, within which systems the information exists, and knowledge of how to use existing systems. Data analysis revealed that the user’s knowledge of the data available was perceived to be a critical step in reusing existing electronic data. There was no defined method of identifying existing electronic systems and it was described as a time consuming and complex task to identify existing electronic systems. Some individuals thought theoretically it was easy but practically difficult to identify existing electronic systems.

“And I’ve had to do that with other pieces of work where you are not quite sure or you have an idea. If you are not quite sure how to go about it you just have to knock on quite a few doors to be able to identify, okay, what’s happening?” Participant 8 [pharmacist]

Different views were expressed regarding the amount of information available about databases. Many participants expressed the view that there was little information available around how to extract data, and understand data, and of how all databases are currently used; however, some participants experienced no major problems in this area. Participants explained how they wanted simple instructions on how to identify data systems, how to reuse data, and within which database this information is held. They wished to address questions around them needing further assistance on certain tasks such as data extraction in order to plan appropriately.

“Some of the systems I find that we use aren’t self-explanatory... It’s not very self-explanatory and I like to just have something that’s relatively easy on the front and I’m not very good at reading the how to be a manual before I actually do. I’d rather just do (laughing)... how they use so I’d rather ask someone than read a manual. So, and then that’s just the way I learned.” Participant 3 [allied healthcare professional]

Potential secondary data users were identified to be academics, chief executives, managers, and clinicians within the organisation.

Phase 2: Functional specification of a prototype meta-data resource and development and pilot evaluation.

Below the summary of the barriers and facilitators of secondary use of data and user requirements for the PSAQIM tool can be seen. The PSAQIM functional specification was derived from the analysis performed using the interview data. Specific questions were asked to participants if they had the option of having a meta-data tool what information would they like to see, and how would they would like it to be presented. Further questions were then instigated based on the participant's response. The data was analysed using an inductive approach and then deductively to help categorise the themes. After reviewing these themes it became apparent they focus on 3 main elements of the tool: its purpose, functionality, and layout/design. Then based on these themes and sub themes a specification was produced (as seen in table 3 below).

Summary of the barriers and facilitators of secondary use of data and user requirements for the PSAQIM tool development

The high level themes that emerged from the barriers, facilitators, and user requirements were: organisation, technology, users' knowledge, and secondary use of data process. The main barriers elicited included the inability to gain the information the users' needed and the users' requirement for an easily accessible data. The following were identified as barriers to secondary use of data based on the interview data: time constraints, views on sharing data and the system functionality (based on primary use).

The main information users of secondary use of data need is around what systems and data exists, who to contact, and how to gain access. Participants expressed the fact that gaining access to databases is an unclear process, this was determined mainly by whom the individual knows and what their job role is within the Trust. The organisational issues that require consideration include information governance policies; lack of data reuse in general within Trusts due to time constraints and job pressures; and no policies around secondary use of data as data reuse is underutilised. Therefore, it is important to have a clear procedure in place for all healthcare professionals to follow and gain access easily, while ensuring all the data will be used within the terms and conditions specified in the Trust.

There seems to be a sequence of barriers individuals faced when trying to identify existing data within the organisation. The first is their knowledge around the data that existed, followed by some organisational factors that can either facilitate or hinder the process for individuals (trying to identify people to gain further information from, gaining access to data, and data policies to be considered), and then technological issues (user friendliness of the system and data quality).

Participants want a meta-data tool that is easy to use and clearly helps identify the databases that may be of interest to them. They wanted a variety of information around the databases and data sets available within the organisation specified in table 3 below. Nevertheless, this is the starting point for identifying useful databases for individuals within an organisation, what could potentially be important is knowledge around how they could use this data appropriately for quality improvement purposes within their current setting. It is therefore important to have useful links on the meta-data tool that provides information on the following points: quality improvement tools, quality improvement case studies, implementation science resources, and information governance

and local trust policies around data use. This will provide a platform for individuals exploring how data can be reused, and what factors they need to consider when improving the quality of services and processes within their organisation.

To allow continuous system improvement, it is also important to allow users to have the chance to feedback on the meta-data tool, the data systems available for reuse, and the data held within them. Therefore, providing a platform to make comments on the way users have reused data, potential tips for other users, and comment on the systems and data available for reuse would be extremely resourceful. Having these additional features added to the original tool specified by the participants will enable users to consider other key factors such as organisational policies, quality improvement tools, and an interactive user forum (allowing people to post their experiences of using the data listed on the system).

User-led specification for a user-friendly meta-data tool enhancing secondary use of data and existing knowledge of information asset register

Of all the 20 participants, six were asked whether they had heard of the IAR, of whom only two knew about the IAR but neither had used it. All 20 participants were asked if a meta-data source became available, what they would like to see. The participants stated what they wanted from the meta-data tool by commenting on the following three elements: the systems presentation, functionality, and the information it held.

The participants wanted a user-friendly (and visually appealing) meta-data tool that had a succinct set of information about existing databases (including a small summary of information containing key points about the databases). The database information should be in an easy to read font size while some participants even suggested table formatting. The meta-data tool should have an easy to use hierarchical structure, should be easy to follow, and present concise information without clutter.

The participants wanted the meta-data tool to have an easy search functionality to identify the electronic databases that exist within the organisation (via a search box for entering keywords relating to the database). They also stated they wanted an alphabetical list of all the databases available within the Trust and have a page that helps guide through the meta-data tool showing how to use the meta-data tool, including a help search function. The meta-data tool should allow easy filtration of the search results to aid in identifying systems relevant to the user; this could be the department the system resides in or the location. They wanted the ability to edit searches easily instead of having to start afresh. This meta-data tool should enable staff members to understand what data is available, who to approach and how to gain access.

They wanted particular types of information about the databases within the Trust that have been stated in table 3 below, the main information around the databases were the details of the database containing the data, the databases functionality, its location, how to get access to the database, its primary use in the organisation, and how it is managed. The following information regarding the data was required by participants: the type of data available in a database, the data quality, the collection period, data limitations and population covered by the data. The user specification produced for PSAQIM can be seen below.

Design rationale:

- 1) Provide a user-friendly, engaging and enhanced interface to the IAR that facilitates access and use of the information contained in the database by the target end-user, specifically for quality improvement purposes.
 - Definition of “target end-user”: front-line healthcare professionals and clinicians (and their departments/units/teams) responsible for delivering care to the patient directly. This is in contrast to the predominant existing IAR user base which comprises Trust information technology professionals, information governance-related roles and data assurance stakeholders (collectively representing technical and regulatory compliance perspectives).
 - Definition of “use of data for quality improvement purposes”: use of existing local data sources to monitor or audit variations in care processes, to analyse/mine/investigate opportunities for improvement/priority areas suggested by the data and to evaluate the efficacy of any remedial measures taken in local clinical work systems to improve care.
- 2) Where indicated through analysis of end-user perspectives and potential use-cases, to expand the existing meta-data and information embedded in each IAR record, to maximise usefulness to clinical end-users for quality improvement. This will include facility for end-users to contribute relevant content, including updating the IAR as local databases evolve and inputting information and resources to facilitate access and use of the databases by peers and other clinicians, thus building an online knowledge repository for effective use of local data for quality improvement.
- 3) Provide accessible, context-relevant links to broader information sources and guidance concerning use of data for quality improvement, including general improvement science sources linked to data-driven improvement and specific user-contributed resources for specific databases and clinical areas.
- 4) Facilitate timely and appropriate access of databases, by providing and flagging guidance on the correct information governance processes, data owners and entitlements.
- 5) Increase knowledge in clinical and other frontline care delivery teams of the range and content of local databases that are available, through promotion of ease of use, re-use and an evolving peer-to-peer knowledge-based resource.
- 6) Integration of PSAQIM with any existing online resources for patient safety/quality improvement, to facilitate access and awareness of the tool.

Requirements for PSAQIM tool:

Promotion:

- Promote PSAQIM tool on Trust intranet.
- Providing links to PSAQIM tool on other patient safety and quality improvement online resources.
- Providing link on Information asset register (IAR) for the PSAQIM tool (on IAR homepage and on the page of search results).

Presentation:

- User-friendly (visually appealing)
- Small blurb containing key points about the data systems
 - Summary of the database
- Table formatting easy to read
- Easy to read size and font
- All of the above requirements are essential

Functions:

- A search tool on the first page to allow search keywords and identify relevant databases.
- Allow options to filter search results to identify relevant data set.
- Ability to search database names using the departments they are used in e.g. pharmacy department would have the pharmacy dispensing system.
- Ability to view all the database names within Imperial College Healthcare NHS Trust alphabetically.
- Useful links section on the first page which provides information on the following points:
 - Quality improvement tools
 - Quality improvement case studies
 - Implementation science resources
 - Information governance and Imperial College Healthcare NHS Trust policies
- Information provided about the webpage and what PSAQIM is.
- ‘Help searching’ function which provides information on how to search the database and what information is provided and where (example database page which provides details on all the database information).
- Filter search results based on the department, where database is used and location.
- Ability to edit search term used after search has been run.
- Sort the results alphabetically or as the most relevant database.
- Function to start new search strategy and scrap the old one.
- Feedback form for PSAQIM users (on the individual database pages i.e. page 3 in the PowerPoint presentation).
- Section for users to comment on the databases they have used and write potential tips for other users (on the individual database pages).
- Section for users to comment on whether something about a database is out of date or needs to be changed (on the individual database pages).

Table 3: Information participants wanted to obtain regarding data and database(s) through the meta-data tool.

Themes	Provide the following information for each database webpage searched on the PSAQIM prototype:
Data	Definitions of the data fields for each database and whether those fields are currently in use or have been changed over time.
Data quality	Whether the data quality is checked within each database (i.e. data completeness and accuracy)
Data collection period	How often the data is collected. Time periods covered by that dataset.
Data limitations	Potential data limitations.

Data population	What patient groups are covered within the dataset?
Database	Database names.
Database content	How old will the dataset be?
	Warnings or information regarding the data held in the database.
	What variables exist in that database?
	Assigning keyword or terms to electronic systems listed.
	Information on key-fields covered in that dataset.
	What data is available on that database?
Databases functionality	Which electronic systems are linked to this database?
	Information on how to use the system.
	Who collects and inputs the original data?
Database location	Location or where that system is used i.e. lab or wards.
	Where is the data stored?
Database access	Is the data accessible for research?
	Who has access to that data and restrictions on access?
Database use	What the system is being used for currently and purpose of data collection.
Management	Contact name responsible for that database.
	How is the dataset managed?
	How often data is updated.
	How would users extract the data and who to do they contact for extraction.
	Who owns the database?
	Who to contact to speak about getting access.
	Who to contact to get more information about the database.

User personas produced based on qualitative analysis for development of the PSAQIM tool

User personas were produced using the analysis of the interview data and the specification produced. By identifying the potential user groups, the reasons for use and the main barriers identified with the potential requirements for the meta-data tool, a user persona was formulated. The user personas were then used by the Akendi team to produce the prototype with the main functionality listed above but also matching the user personas provided. In total eight user personas based on the analysis conducted above were produced for: researchers, nurses, doctors, pharmacists, allied healthcare professionals, and information regulators within the organisation. Examples of the user personas can be seen in appendix 3 and two have been stated below.

User Persona Number 1:

Name: Sam Watkins

Occupation: Clinical research fellow/PhD student

Age: 25 years

Years in Healthcare: one year

Persona Description: This is a persona of an individual who works within research and is medically trained, has excellent IT skills and requires periodic extraction of data to analyse and support his research project. He wishes to use the data for surveillance and identify trends, what is happening locally, monitoring services and assessing the impact of other interventions implemented locally.

Background & Lifestyle: Sam is a full time postgraduate PhD student and is in a long term relationship. He lives in student accommodation at the university campus and loves to travel around the world.

Experience: Surgical research fellow & operational research

Primary common tasks: Research e.g. PAS records, surgical records

Attitude: Believes it should be easy to gather relevant information required for research purposes. Doesn't understand why the process is complicated in this generation where technology is widely implemented and commonly used.

Typical usage: Variable based on the project, he has a mobile phone and access to computers on the main site for research (i.e. remote access).

Common tasks: extraction of data from various systems such as electronic prescribing and PAS systems electronic system and identify who to approach to extract that data. What other data sets might exist that may be relevant for them.

What he/she need: A user-friendly and visually appealing meta-data source, a good search tool function to allow easy data identification using keywords and options to filter results to identify relevant datasets. Having information around the information governance concerns and ethics and understand the reliability of the dataset that exists and they wish to reuse.

User Persona Number 2:

Name: Maggie Smith

Occupation: Head of Pharmacy Department

Age: 59 years

Years in Healthcare: 35 years

Persona Description: This persona covers individuals who wish to reuse data on a monthly basis to help with reporting and monitoring their departments.

Background & Lifestyle: Works full time, is married and a mother of two. Travels 0.5 hour every day for work. Loves to spend time with her family and grandchildren.

Experience: Pharmacy, clinical and nursing services & Department/directorate level

Primary common tasks: Monitoring of quality and safety within department (assurance), needs access to finance data, sick leave records etc.

Attitude: Audit and research projects are essential part of her role. Lots of data exists, but it is hard to understand the information each system contains and how regularly the databases are updated.

Typical usage: Have reports already set up from local electronic system. Moderate and has a private office and two forms of technology available to her, a laptop and a desktop.

What he/she need: Knowledge about the data that exists within an organisation when new reports are asked to be produced on information she is not familiar with. Understand the limitation that

exist within the datasets potentially compare databases across different departments who maybe performing better. Would like a small blurb containing key points about the data systems, ability to search database names using the departments they are used in, and view all the databases alphabetically so can scroll through the lists very easily. Wants a simple procedure for being able to apply for accessing an information system.

Overview of the PSAQIM pilot tool and evaluation

Mid-fidelity prototype produced

The screenshot shows the PSAQIM Home screen with the following elements and annotations:

- Header:** "PSAQIM | Patient Safety and Quality Improvement Metadata" and "Enhancing re-use of existing data to drive quality improvement".
- Log in details:** A box pointing to the "NHS Trust" and "Help" icons in the top right corner.
- Welcome message:** A box containing the text: "Welcome to the new PSAQIM portal. This system is designed to enhance the re-use of routinely collected data to support initiatives to monitor and improve the quality care. The aim of this system is to: 1) Facilitate identification of relevant existing data sources for quality of care in your speciality area. 2) To aid the identification of and access to pre-existing data sources to support quality improvement. 3) Provide guidance on how to use routinely collected data to improve quality of care. 4) Capture learning and share experiences with colleagues concerning how to make better use of data. 5) Improve the accuracy of information on available data sources and their use in quality improvement work. [How do I re-use data for quality improvement? Information and resources](#)".
- Aims of the site and links to the steps in order to reuse data:** A box pointing to the welcome message.
- Let's get started!:** A section with a search box labeled "Search for a database..." and a "Search" button.
- Search box:** A box pointing to the search input field.
- Feedback regarding existing databases and PSAQIM:** A box pointing to the "Community Feedback" section.
- Community Feedback:** A section with "Ratings" and "Comments" sub-sections, each with an "IMAGE" placeholder and a short paragraph of text.
- Browse all databases by:** A section with three filters: "Database name", "Department", and "Speciality".
- Your accessed databases:** A list of databases: "JAC Medicines Management", "Aria E-Prescribing MedOnc Manager", "VitalSigns", "Astraia Foetal Medicine", and "Keystone". A "View all" link is at the bottom right.
- Access to the databases based on job role through personal log in:** A box pointing to the "Your accessed databases" list.
- Helpful Links:** A section with three links: "Patient Safety First How To Guide for...", "QI made simple", and "MUSIQ model".
- Links to other information to help reuse data:** A box pointing to the "Helpful Links" section.
- Give us Feedback!:** A button with a speech bubble icon.

Figure 3: PSAQIM Home screen shot

The homepage provides information around the aims of the system. Below that a link is presented which takes to a different page presenting the resources to support reuse of data. The two search functions i.e. manual text entry and search and browsing all databases by 3 fields: database name, department, and speciality. The homepage also presents the list of databases the user already has access too and this helps remind them of what they currently can access. The helpful links presents all the links that may be useful for users in reusing data (i.e. theoretical and practical work). The homepage provides users with the opportunity to provide feedback regarding the systems they have reused data from. Users can also make comments regarding the tool to help improve the tool and ensure it meets all the users' needs. All these are representative of the user requirements identified in using the data in phase 1 and based on the specifications identified above. These features enhance the opportunity to feedback, different methods of searches, and provide guidance through clarifying steps for data reuse and relevant literature and factors users may need to consider.

PSAQIM | Patient Safety and Quality Improvement Metadata
Enhancing re-use of existing data to drive quality improvement

NHS Trust
Help

Resources to support effective reuse of data for quality improvement.

Why you might want to reuse data?

The reasons to reuse data are three-fold:

1. To evaluate current standards (i.e. identifying gaps or variation) in care delivery and determine whether a quality improvement intervention is required.
2. To evaluate the effectiveness of an intervention implemented with the intent of improving quality of care (by changing processes/systems/behaviour).
3. To use existing information as an intervention to drive quality improvement in your current setting e.g. providing feedback to prescribers to reduce medication errors.

There are 8 main stages involved in effective reuse of data. This page has been designed to show you how the PSAQIM tool can support you through these stages and provide other relevant resources which may be useful to you.

1	2	3	4	5	6	7	8
Planning	Data knowledge	Data access	Data validation	Data extraction	Data interpretation/analysis	Data use/application	Sustainability

1. Planning

Key point: This stage will help you plan the next steps and consider any factors which potentially may become barriers if not considered in advance, potentially saving you time.

Suggestions to increase effectiveness:

- Clearly plan the questions you are trying to answer and select the measures you require.
- Identify other key team members you may need based on their skills, knowledge and expertise and determine their role in the project.
- Gain approval from your manager and identify the individuals your results will have an impact on.
- Take a scientific approach for your project and potentially use the SQUIRE guidelines to help produce a report.
- Identify the aims and objectives, the data measures you have selected, method of analysis and data dissemination, and the individuals your results will impact or influence.
- Establish whether ethics will be required (see the guidance below for research, quality improvement, audits and service evaluation projects).

Resources for planning stage:

- [Patient safety first measurement document](#)
- [QI made simple](#)
- [Defining research document](#)
- [SQUIRE for intervention based data](#)

2. Data knowledge

Key point: This is the stage where you identify any relevant databases which may contain data you require for your initiative.

Suggestions to increase effectiveness:

- Using the PSAQIM portal search for the relevant databases based on the measures you aim to obtain
- The PSAQIM portal will provide you with the operational status of the electronic database, the level of records available, the location of the system, the sensitivity (i.e. whether the data contain patient level information), experiences of previous users of the database, the time period from which the data has been recorded on the database and the types of data.

Resources for data knowledge stage:

Potential reasons for data reuse

Different stages of data reuse

Potential suggestions to optimise each stage and potential resources that could be useful

Figure 4: A snapshot of the resources page after the user clicks “how do i re-use data for quality improvement? information and resources”

The resource page above provides information on why data maybe re-used and the steps involved. Within each step it includes suggestions to increase effectiveness and potential useful links to documents that may help users with that particular step. There are 8 main stages for data reuse which have been stated and guidance has been provided for, however for illustrative purposes only a snapshot of the first two have been provided. This page provides guidance for users to demonstrate what the stages of data reuse are and how to optimise each stage by providing information and material to assist them as per their requirements specified above.

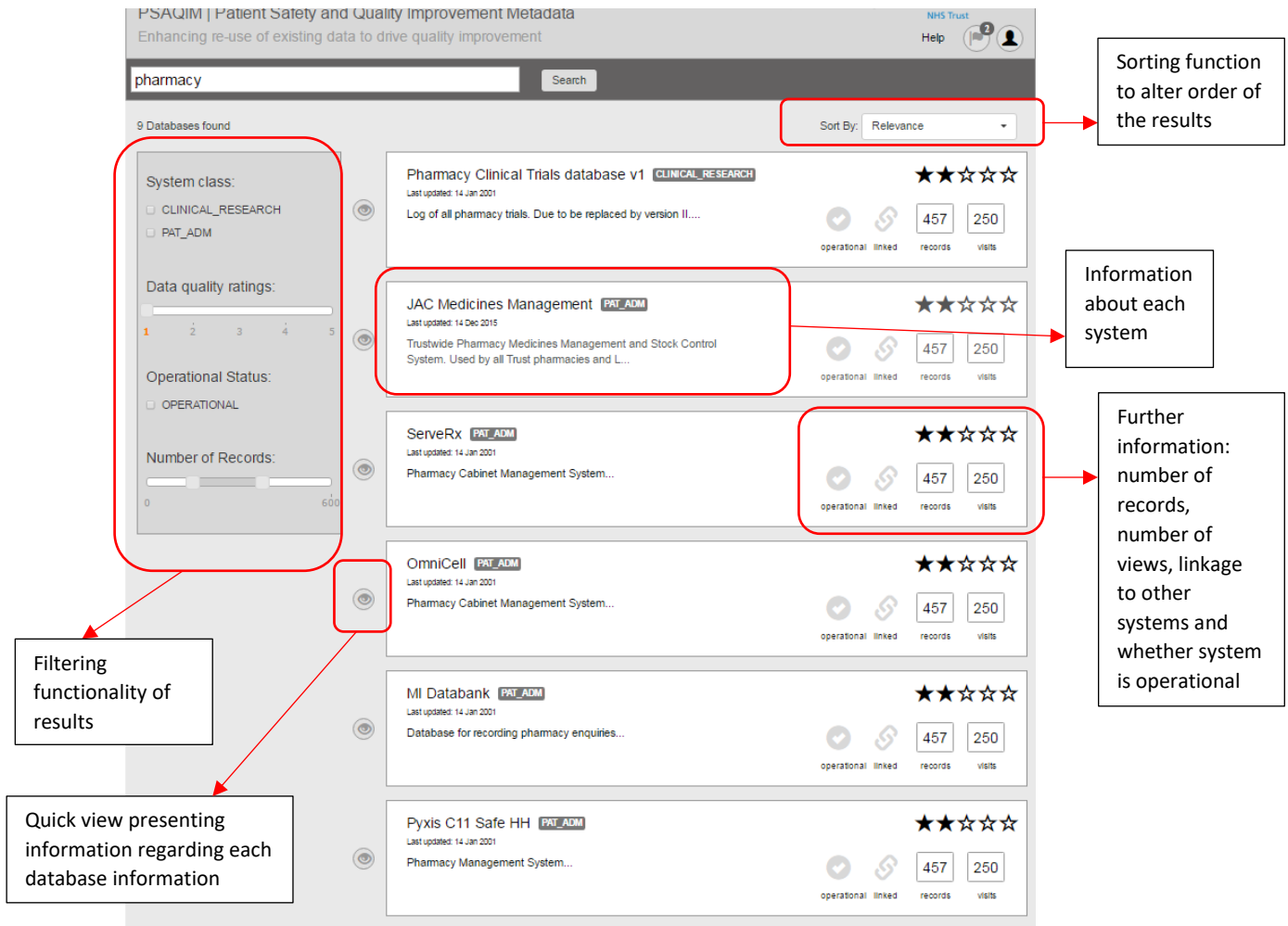


Figure 5: A snapshot of the search results page showing all the relevant databases containing the term searched (in this example the search term was pharmacy).

The search results page allows the user to sort the results based on relevance date, number of visits, and user ratings. To further filter the results down users can select the system class, data quality ratings, operational status, or number of records available. Next to the small summary for each database there is an eye icon that provides an overview of the database, and further information regarding the databases operational status can be found within the summary (for example: inactive or active, linked to other databases, the number of records it contains, the number of visits by users, and the overall rating provided by users for that system). By clicking on one of the database results, the user is taken to a screen that presents detailed information regarding the selected database, an example of this screen can be seen in figure 7.

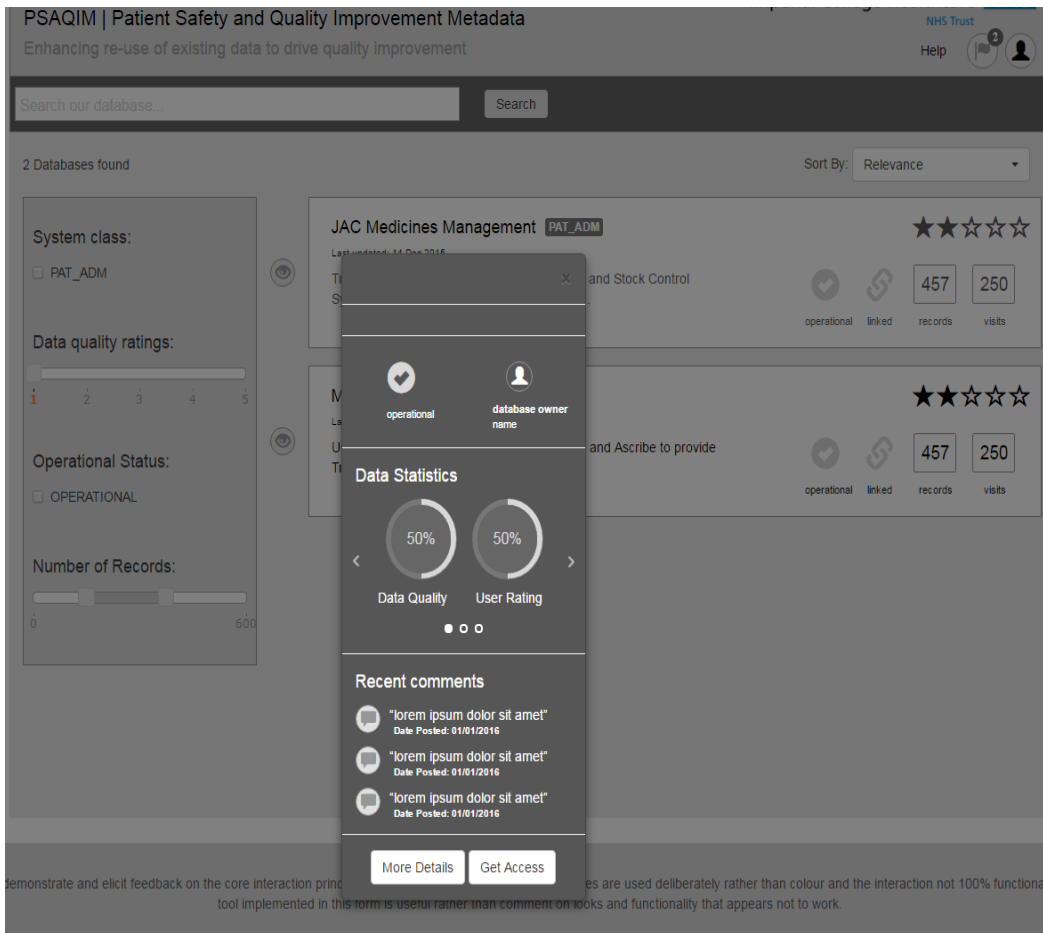


Figure 6: A snapshot of the quick view information presenting a small summary about each individual database after clicking the eye sign next to each of the database section.

The eye icon provides information about the database owner, whether the database is operational, the data quality and use rating statistics, and most recent comments made about the database. From reading this information, the user can click on “more detail” to go onto the information page for that particular database which provides further information (see figure 7) or click on “get access” to fill in the request form for access (see figure 8).

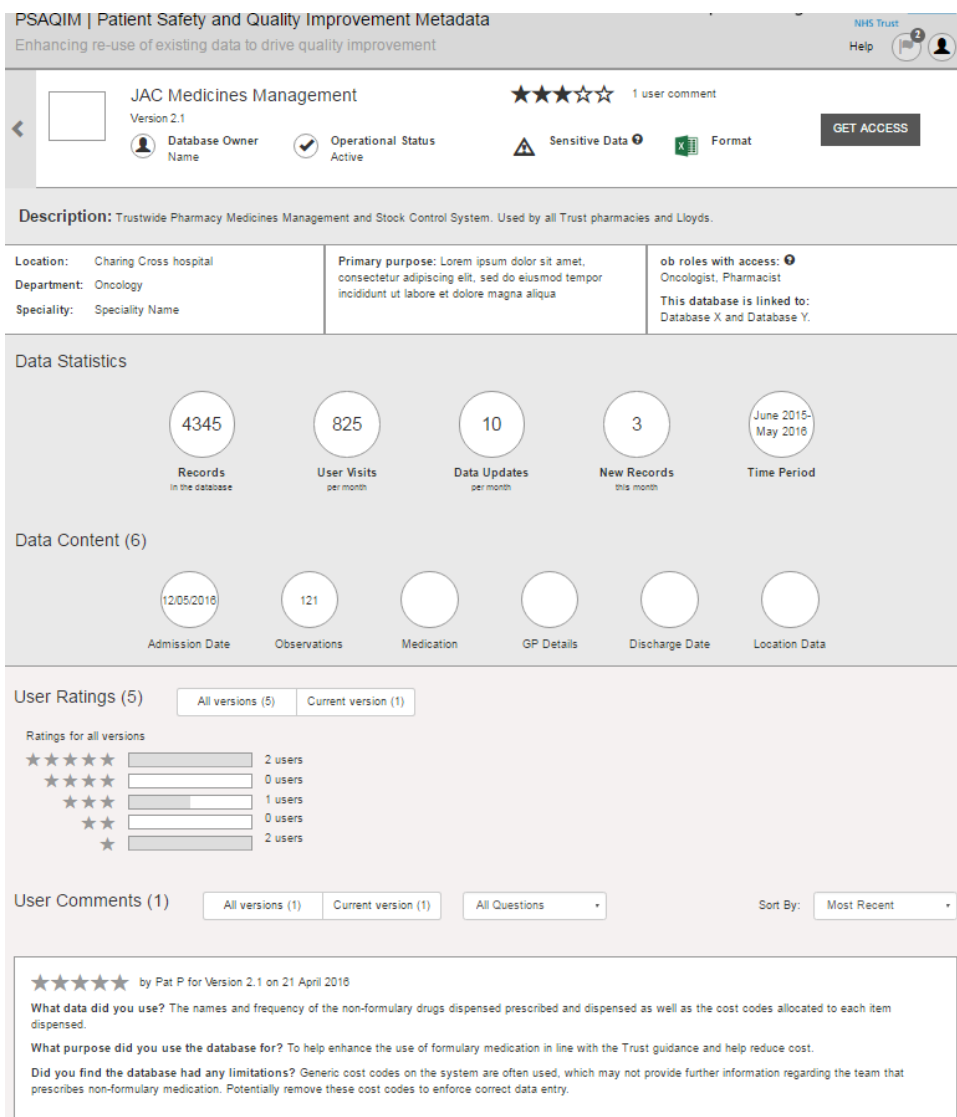


Figure 7: A snapshot of the information page of each individual database held within the trust.

The information page for each database provides information on the database owner, the databases operational status, whether it contains patient level data (i.e. sensitive data), and the format it is available in. It also provides details on the databases location, department, speciality, data statistics, data content, provides a platform for users to understand how other users may have used the data, any data limitations they may have identified, and the type of data they used.

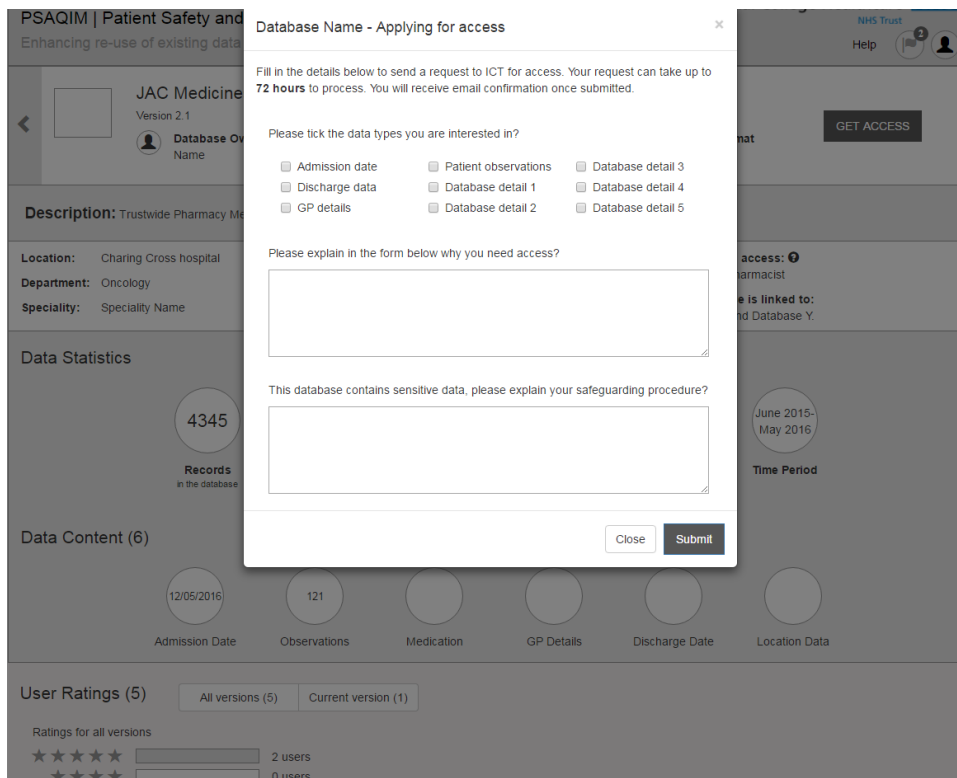


Figure 8: A snapshot of the application form to gain access to data after clicking “get access” on the individual database page (as shown in figure 6).

The application form to apply for access provides further information to the user regarding the turnaround time for the request. The form is easy to complete as it provides options for individuals to select, and provides further information around why they need that data while assessing whether they have thought about potential confidentiality issues.

Results for the PSAQIM small-scale prototype evaluation

A small scale evaluation was performed on the prototype illustrated above for potential users to comment on. This helped determine the applicability of the system and gain views from users to determine whether the prototype had successes in achieving the aims and objectives set.

Demographics of respondents

In total there were seven responses to the survey, comprising a doctor, a doctor / researcher, two researchers, a researcher / pharmacist, an allied healthcare professional, and a nurse. Of the seven respondents, three had been in their job role for less than a year, three for 1-5 years, and one for 6-10 years. A small scale evaluation was performed with respondents of specific varied roles. The main aim of this small scale evaluation was to gather initial feedback on the prototype tool as a large amount of work was conducted prior to the prototype production to support the specifications listed for the developer based on the needs of the users.

Review of the tool meeting its purpose, the tools layout and the tools functionality

The ratings evaluating the tool’s purpose, functionality, and layout are presented in the three tables below (table 4-6). All respondents completed the survey without any information being omitted. All the scores for the system’s purpose, functionality, and layout had median scores above 6.

Table 4: Likert scale data results for questions asked in PSAQIM survey exploring whether the tool met the aims set (using a 8 point likert scale – where 1 is strongly disagree and 8 is strongly agree).

Question: In your opinion, to what extent does the tool achieve each of the following aims:	Mean (standard deviation)	Median	Range
The PSAQIM tool will facilitate identification of relevant data sources in my speciality	6.57 (1.5)	7.00	4-8
The PSAQIM tool will provide sufficient guidance on how to use routinely collected data	5.71 (1.8)	6.00	2-7
The PSAQIM tool will capture previous experiences of reusing data by colleagues to help learn more about the data that exists	6.43 (1.0)	7.00	5-7
The PSAQIM tool will help enhance reuse of data for quality improvement and maximize the value of investing in data systems	6.71 (1.0)	7.00	5-8

The respondents felt the following three aims were met with the PSAQIM tool with a score of 7 out of 8: identification of relevant data sources, capturing previous experiences of reusing data by colleagues, enhancing reuse of data for quality improvement, and maximising investment. The respondents found PSAQIM to provide sufficient guidance on how to use routinely collected data (with a slightly lower score of 6). There was a large range between the scores for the following two statements: the tool identifying the relevant data for a particular speciality (with a range of 4) and the tool providing sufficient guidance on how to use routinely collected data (with a large range of 5). This low result may be related to the comments stated below in relation to the limited number of databases available within the tool. However, as this was a prototype it was not feasible to include all the databases within the Trust, hence addressing the cause of the low scores. Some guidance such as local trust policy could not be provided as it was under review when the tool was developed.

Table 5: Likert scale data results for questions asked in PSAQIM survey exploring participants’ views regarding the PSAQIM tool (using a 8 point likert scale – where 1 is strongly disagree and 8 is strongly agree).

Question: Please rate the following statements based on your view of the PSAQIM tool	Mean (standard deviation)	Median	Range
The PSAQIM homepage clearly presents the purpose behind PSAQIM and how it will be useful to me	6.57 (1.1)	6.00	5-8
The database search and browsing option (screen 1) are helpful in searching for databases that a user is interested in	6.14 (1.1)	6.00	4-7
The information presented on the search results page (screen 2) is logical, clear and sufficient	6.86 (0.7)	7.00	6-8
The detailed information presented for each database (screen 3) is useful	6.86 (0.7)	7.00	6-8
The facility on the tool for users to comment on the database is useful	6.14 (1.6)	7.00	4-8

The ability to complete a form to gain access to a database is useful	7.00 (0.8)	7.00	6-8
The iconology across the whole tool was clear and easy to understand	6.29 (1.3)	6.00	4-8

The respondents found figure 5 and figure 7 to be useful, logical, clear, and sufficient with a score of 7 out of 8. A similar score was provided for the user comments function within the PSAQIM tool and the form to gain access to other databases. Whereas the iconology, the homepage search, browsing option, the portrayal of the main purpose of PSAQIM, and clarity around its usefulness to potential users scored a slightly lower score of 6 out of 8. The largest difference between the scoring (a range of 4) was seen in the following two statements: the comments section for users within the tool and clarity around the iconology. Therefore, clarity is needed around the comments section for users explaining its purpose and the purpose of the iconology.

Table 6: Likert scale data results for questions asked in PSAQIM survey exploring participants' views of the PSAQIM tool after using it (using a 8 point likert scale – where 1 is strongly disagree and 8 is strongly agree).

Question: Please rate the following statements based on your experience of using the PSAQIM tool:	Mean (standard deviation)	Median	Range
The overall presentation and layout of the PSAQIM tool was satisfactory	6.71 (1.1)	7.00	5-8
The guidance and database information provided within the tool was clear and presented in a helpful way	6.14 (1.1)	6.00	4-7
Generally the PSAQIM tool was easy to use, logical and allowed me to access the information I am interested in	6.43 (0.5)	6.00	6-7
The tool was easy to navigate	6.71 (0.5)	7.00	6-7
It is easy to locate information on the tool	6.57 (1.0)	7.00	5-8
I believe the tool will be welcomed by healthcare professionals within the trust	6.29 (1.4)	7.00	4-8
I believe there is a need for this tool within the Trust	7.00 (0.8)	7.00	6-8
I would use this tool in my day-to-day practice to support my quality improvement activities	6.00 (1.2)	6.00	4-7
I believe the tool will enhance the re-use of data for quality improvement purposes within the trust	6.71 (0.8)	7.00	6-8
I believe the tool has the potential to be effective in supporting broader quality improvement in the trust	7.00 (0.6)	7.00	6-8
Having used PSAQIM I would recommend it to my colleagues	6.57 (0.5)	7.00	6-7

Respondents felt that the PSAQIM tool presentation and layout were satisfactory, the tool was easy to navigate and locate information, the tool would be accepted by healthcare professionals, the tool would enhance reuse of data for quality improvement purposes and support quality improvement, and that they would recommend this tool to colleagues (all of which received a score of 7 out of 8). Respondents felt they had access to information they needed through the tool, the guidance within the tool was clearly presented, and the tool would support their daily quality improvement activities (all of which received a score of 6 out of 8).

There was very little difference between the scores (i.e. range within the scoring given by respondents) for all the questions in table 6 except for one statement that had the largest range in scoring. This statement asked whether the respondents felt the tool would be welcomed by health

care professionals within the trust. The guidance available within the tool was given scores of 4-7, containing one of the lowest scores and second largest range amongst the statements presented above. Of the seven respondents only six commented on ways to improve the PSAQIM tool and comments made can be viewed in table 7 below.

Table 7: Evaluative comments made about PSAQIM tool by respondents in the survey.

Comments by respondents	Incorporation of comments into future system design
<i>"Maximizing the number of data sources it covers"</i>	This was a mid-fidelity prototype with limited data sources, when implemented it would contain all the data sources available within the Trust
<i>"There is a lot of information on each page, just to simplify, have drop downs to list databases to select (especially if you are not sure which database to choose), data descriptions should be more informative about what is in them, but I am not a clinician so wouldn't know what to look for."</i>	The option to limit your search exists using the filtering functionality on the left hand side of the results page and list of all databases is available alphabetically for users on the home page instead of having to search for databases. Further detail for each database will be requested by IT from the system owner to provide more information for users, if this tool is implemented.
<i>"Delivering the aims in a punchier, more direct way on the homepage. Make it seem more personal and more focused on how the tool will affect the user directly."</i>	Reducing the length of the aims of the tool to few words would enhance emphasis: Potential re-wording: Identifying existing data. Easily apply for access to existing data. Guidance available to help reuse data. Share and learn from others experiences of data reuse. Feedback to help improve accuracy of information for data systems and their use for quality improvement.
<i>"Difficult to say at this point as I am unable to access the actual databases - so difficult to know how easy it is to see the data and manipulate the data"</i>	A proof of concept prototype was built to provide information regarding the data, but the access form will be able to provide a uniform manner to ease the process of access.
<i>"No real significant improvements to suggest-it appears very accessible and user-friendly."</i>	Respondent happy with the tool.
<i>"A very supportive roll out of the system would be needed with clear advertising of the what and why the need for this system"</i>	Dissemination of the tool and advertisement during rollout would require support from senior management amongst teams, emails, newsletters, and posters.

6. Discussion and lessons learnt

The high level themes that emerged from the barriers, facilitators and user requirements were: organisation, technology, users' knowledge, and secondary use of data process. The main barriers elicited included the inability to gain the information the users' needed and the users' requirement for a system containing all the information that is easily accessible to them. The interview data suggested time constraints, views on sharing data and the system's functionality (based on primary use) were the main barriers to secondary use of data.

The main information that users of secondary use of data needed was around what systems and data exist, who to contact, and how to gain access. Participants expressed that gaining access to the databases is currently an unclear process; this is determined mainly by whom the individual knows

and what their job role is within the Trust. The organisational issues that require consideration include information governance policies; lack of data reuse in across the trust due to time constraints and job pressures; and no policies around secondary use of data as data reuse is underutilised. Therefore, it is important to have a clear procedure in place for all healthcare professionals to follow and gain access easily, while ensuring all the data will be used within the terms and conditions specified in the Trust.

There seems to be a sequence of barriers individuals faced when trying to identify existing data within the organisation. The first is their knowledge around the data that existed, followed by some organisational factors that can either facilitate or hinder the process for individuals (trying to identify people to gain further information from, gaining access to data, and data policies to be considered), and then technological issues (user friendliness of the system and data quality).

Participants want a meta-data tool that is easy to use and clearly helps identify the databases that may be of interest to them. They wanted a variety of information around the databases and data sets available within the organisation specified in table 3 above. Nevertheless, this is the starting point for identifying useful databases for individuals within an organisation, what could potentially be important is knowledge around how they could use this data appropriately for quality improvement purposes within their current setting. It is therefore important to have useful links on the meta-data tool that provides information on the following points: quality improvement tools, quality improvement case studies, implementation science resources, and information governance and local trust policies around data reuse. This will provide a starting point for individuals exploring how data can be reused, and what factors they need to consider when improving the quality of services and processes within their organisation.

It is also important to allow users to have the chance to feedback on the meta-data tool, the data systems available for reuse, and the data held within them to allow continuous system improvement. Therefore, providing a platform to make comments on the way users have reused data, potential tips for other users, and comment on the systems and data available for reuse would be extremely resourceful. By having these additional features added to the original tool specified by the participants will encourage users to consider other key factors such organisational policies, quality improvement tools, and an interactive user forum (allowing people to post their experiences of using the data listed on the system).

The prototype evaluation demonstrated that the function, layout and usability of the tool were satisfactory. However, due to the limited response rate, another larger scale evaluation may be required, where the prototype is actually implemented across sites in different teams. This would help determine whether it meets user requirements and could enhance secondary use of data practically and whether it could link all the electronic systems of one large trust together for all staff members and produce a uniform process of gaining access.

Strengths and limitations:

The limitations for this study included the small sample size for evaluation. The interviews conducted to identify the specifications for the prototype had only 2 interviews from allied healthcare professionals. However, in total 20 interviews were conducted and data saturation was reached. The strengths of this mixed method study includes the following: the overlapping of data

analysis between two researchers hence increasing the reliability of the data analysis, the pilot evaluation of the tool, and production of tool driven by the data requirements specified by users.

Reflections on practical application of theory to enhance local secondary use of data

Practical application of theory in practice and implications for future research

The tool was produced based on the results of the deductive analysis, user proformas, and user specification; the PSAQIM tool was successful in addressing the barriers and limitations around secondary use of data .

This study illustrates that a meta-data tool sign posting existing systems with a clear process for data access, and guidance for data reuse could help enhance secondary use of data and address various factors that influence secondary use of data. This can then assist in identifying practical solutions that may address not just one, but multiple limiting factors hindering secondary use of data that exist in their organisation.

Production of the prototype and application

It was difficult to interview individuals from different professional backgrounds due to time constraints. Efforts were made to contact managerial leads within different professional groups to gain their support but with limited success. However, if the primary researcher was based within the organisation with easier access to the different healthcare professionals, then this could have increased the number of interviews and the survey response rate for evaluating the PSAQIM tool.

The preliminary conceptual framework, user specification, user personas, and valuable input from the project team helped towards the production of the PSAQIM tool. It was important to gain input from the local ICT team to gather more information around the current process for accessing existing data. This was a time consuming task but they expressed interest in the prototype for future implementation. Clear communication between the teams (project team, ICT team, and the Akendi team) was important to ensure the aims of the PSAQIM tool were met and any concerns that arose were addressed. The concept of a meta-data tool may seem simple, however, in order to be successfully implemented it requires the following:

- Support and approval from different key leaders within different departments of the organisation: such as ICT, information governance, and digital communication team. Individuals will only be interested in the concept presented if they have a personal interest in it.
- Having the right skills within the organisation: for example, if the ICT skills to produce a prototype existed within the organisation then the prototype production would not have been outsourced.
- Having a multi-disciplinary team: helped re-evaluate the tool production and critique the ideas proposed. Based on the teams practical experience of working in the Trust, with electronic systems, and research backgrounds and knowledge allowed better tool development.
- Knowledge of context and processes: It is important to know the standard processes that exist which may be influenced by the tools implementation. The tool's sustainability should be considered e.g. who would update the data regularly.

Practical outputs:

- The production of functional requirements specifications with practical user cases embedded within a large qualitative interview study.
- Production and small scale evaluation of the meta-data prototype.
- Contributions to a larger study (i.e. an improvement science PhD) focusing on ways to enhance secondary use of data in secondary care.
- The ICT team using this project as a pilot and developing a business case for the production of a meta-data tool.
- Project publications.

7. Conclusion:

Barriers were identified in trying to find information regarding existing electronic data within a large teaching NHS Trust with multiple sites and these were: organisation - access to data, working with others and organisational issues (process of gaining access and data linkage); technology - system friendliness and data quality; and users' knowledge around - data extraction, knowledge of existing data sources, and how to gain further knowledge around systems was unclear. To date there has been little focus from the clinical frontline perspective on the tools to support effective re-use of data enhancing support quality/safety improvement. A user-led meta-data tool was produced to enhance secondary use of data locally. This allowed a uniform process for all healthcare professionals to follow in order to gain knowledge around existing data resources, identifying relevant guidance in secondary use of data, a platform to share experiences and learn from others, and be able to apply to gain access to data. This was a mid-fidelity prototype that received positive responses with a small-scale evaluation. A larger evaluation should be conducted when the prototype is implemented and assess the impact of data reuse practically pre and post implementation. The main contribution of this project was to conduct a comprehensive analysis of requirements for such a tool, from the end-user's perspective, and to illustrate how such a tool might be implemented, using a requirements-driven, rapid iterative prototyping approach. The end result demonstrates the feasibility of a simple, implementable, user-focused solution that will integrate with existing information asset databases to fully leverage the value of routinely collected data in healthcare organisations to enhance patient care.

Appendix 1: Participant information leaflet, consent form and interview topic guide

Participant Information Sheet for Patient Safety and Quality Improvement Meta-data (PSAQIM) phase 1 interviews– A service evaluation study¹

You are being invited to participate voluntarily in a study due to your position and/or experience and /or knowledge regarding electronic data systems within Imperial College Healthcare NHS Trust (ICHT). This service evaluation study is part of a research project funded by the NIHR Imperial Patient Safety and Research Translational Centre (PSTRC) which has been approved by the Joint Research Commission Office (JRCO) at Imperial.

The purpose of this study is:

- To identify stakeholders' needs for data that can be used for patient safety and quality improvement.
- To identify the relevant databases available within the Trust and the information they hold.
- To explore the barriers and facilitators to the secondary use of existing data for patient safety and quality improvement.

What is your role in this study?

Your role will be to provide your views on the systems you currently use, its accessibility and any concerns you may have regarding the systems. This will enable us to assess the data systems you use, the information you require which is not readily accessible to you, and any difficulties you may have come across in practice.

What will it involve?

You will be interviewed at the most convenient time and place for you. The interview will last approximately 45minutes to 1 hour maximum. The interviews will be conducted by a team member.

What will happen with the data collected?

The data will be collected by the research team and transcribed by an external agency for qualitative analysis. The transcripts will be de-identified and all the data used and reported will be anonymised. All results will be anonymised preventing any possibility to identify individual participant's data even if quotes were to be used in publications. The findings from this study will be published in journals, conferences, and reported to the funder.

You have the right to withdraw at any point during this study without penalty as a participant and any concerns you may have will be addressed appropriately.

Please feel free to ask the research team member any questions.

For further information please feel free to contact the research team:

- Navila Chaudhry (Researcher): n.chaudhry13@imperial.ac.uk

- Jonathan Benn (Principal Investigator): j.benn@imperial.ac.uk

Reference:

¹'Patient Safety and Quality Improvement Meta-data (PSAQIM) Protocol for Phase 1 Study.' Version 3 last updated on the 21/11/2014.

Consent Form

Title of Project: Patient Safety and Quality Improvement Meta-data (PSAQIM) phase 1 interviews– A service evaluation study

Name of Participant:

Position:

Please initial
box

1. I confirm that I have read and understand the participant information sheet dated 21/11/2014 (version 1) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without prejudice or being penalized.

3. I understand that relevant sections of data collected during the study, may be looked at by individuals from the researching team and an external transcribing company. I give permission for these individuals to have access to my data.

4. I am aware any personally identifiable information will not be revealed in any outputs from this study.

5. The information I provide will be used anonymously during this study or any future studies.

6. **I hereby give my consent to participate in this study.**

Participant signature.....Date.....

Name of researcher.....Signature.....

PSAQIM Topic guide:

The questions written in bold and underlined were added post analysis of the first set of interviews to ensure the data provided was more supportive of a few viewpoints expressed in the initial interviews.

Stakeholders' Perspective Interview Schedule:

Opening to Interviews:

1. *Introduce yourself to the interviewee and explain the aims and objectives of this interview:*

The aim of this interview is to explore your perceptions and data requirements in relation to potential secondary use of data to improve patient safety and quality. All the data questions will be in relation to patient safety and quality improvement.

Trust holds a lot of data which could be used more effectively but problems such as not knowing what data are captured and how these may be accessed could be unnecessarily duplicating data collection and wasting time. What we would like to do is find out about the types of data/info you use routinely and what you would like to access if possible for any patient safety or service improvement related work.

2. Read the Information sheet
3. Sign consent form
4. Could you please introduce yourself and state your job title/role/speciality?

Questions:

Databases available:

1. What databases within ICHT do you currently use and what information do you use it for?
 - a. Examples of databases available in trust and the information available
2. What type of data do you use routinely?
 - a. What types of data would be helpful to you but currently do not have access to?
 - b. Is this part of your job role or used for audits/research?**
3. If you wished to access a piece of information that you believed was available electronically within the trust but did not know where it resided how would you resolve this issue?
 - a. Who would they contact?
 - b. Process involved
 - c. Has this happened to them in reality? If so please share the experience

4. Do you encounter any problems or barriers when accessing data? And how do you normally overcome them what do you normally do?
 - a. Process involved
 - b. How did they overcome the problem
5. For what purpose do you collect data?
 - a. Incentives, compulsory data collection or optional?
 - b. Patient safety, quality improvement, hospital services, research?
6. **Are you aware of any meta-data sources within the Trust?**
 - a. **Are you aware of the information asset register?**
7. In an ideal world, what information about data would you like to have when using it for patient safety or quality improvement?
 - a. How would you like it to be presented?
 - b. Any other information you may benefit from?

Secondary use of data:

8. What are your thoughts on secondary use of data in relation to patient safety and quality improvement?
 - a. **Focus on Facilitators and some barriers**

-
9. Who do you think are the main users of secondary use of data in relation to patient safety and quality improvement?
 10. What benefits/ advantages do you see with secondary use of data?
 11. What are the barriers and limitations or factors to be considered with secondary use of data?

Future development:

12. Do you feel secondary use of data should be a common process used in hospitals for patient safety and quality improvement projects, or general improvement in practice?
 - a. And why?

Final question – is there anything else you'd like to add that we haven't covered?

Appendix 2: User requirements/specification

PSAQIM: Requirements specification

Key existing issues that PSAQIM will address

Design rationale:

- 7) Provide a user-friendly, engaging and enhanced interface to the IAR that facilitates access and use of the information contained in the database by the target end-user, specifically for quality improvement purposes.**
 - Definition of “target end-user”: front-line healthcare professionals and clinicians (and their departments/units/teams) responsible for delivering care to the patient directly. This is in contrast to the predominant existing IAR user base which comprises Trust information technology professionals, information governance-related roles and data assurance stakeholders (collectively representing technical and regulatory compliance perspectives).
 - Definition of “use of data for quality improvement purposes”: use of existing local data sources to monitor or audit variations in care processes, to analyse/mine/investigate opportunities for improvement/priority areas suggested by the data and to evaluate the efficacy of any remedial measures taken in local clinical work systems to improve care.
- 8) Where indicated through analysis of end-user perspectives and potential use-cases, to expand the existing meta-data and information embedded in each IAR record, to maximise usefulness to clinical end-users for quality improvement. This will include facility for end-users to contribute relevant content, including updating the IAR as local databases evolve and inputting information and resources to facilitate access and use of the databases by peers and other clinicians, thus building an online knowledge repository for effective use of local data for quality improvement.
- 9) Provide accessible, context-relevant links to broader information sources and guidance concerning use of data for quality improvement, including general improvement science sources linked to data-driven improvement and specific user-contributed resources for specific databases and clinical areas.
- 10) Facilitate timely and appropriate access of databases, by providing and flagging guidance on the correct information governance processes, data owners and entitlements.
- 11) Increase knowledge in clinical and other frontline care delivery teams of the range and content of local databases that are available, through promotion of ease of use, re-use and an evolving peer-to-peer knowledge-based resource.
- 12) Integration of PSAQIM with any existing online resources for patient safety/quality improvement, to facilitate access and awareness of the tool.

Requirements for PSAQIM tool:

Promotion:

- Promote PSAQIM tool on Trust intranet.
- Providing links to PSAQIM tool on other patient safety and quality improvement online resources.

- Providing link on Information asset register (IAR) for the PSAQIM tool (on IAR homepage and on the page of search results).

Presentation:

- User-friendly (visually appealing)
- Small blurb containing key points about the data systems
 - Summary of the database
- Table formatting easy to read
- Easy to read size and font
- All of the above requirements are essential

Functions:

- A search tool on the first page to allow search keywords and identify relevant databases.
- Allow options to filter search results to identify relevant data set.
- Ability to search database names using the departments they are used in e.g. pharmacy department would have the pharmacy dispensing system.
- Ability to view all the database names within Imperial College Healthcare NHS Trust alphabetically.
- Useful links section on the first page which provides information on the following points:
 - Quality improvement tools
 - Quality improvement case studies
 - Implementation science resources
 - Information governance and Imperial College Healthcare NHS Trust policies
- Information provided about the webpage and what PSAQIM is.
- 'Help searching' function which provides information on how to search the database and what information is provided and where (example database page which provides details on all the database information).
- Filter search results based on the department, where database is used and location.
- Ability to edit search term used after search has been run.
- Sort the results alphabetically or as the most relevant database.
- Function to start new search strategy and scrap the old one.
- Feedback form for PSAQIM users (on the individual database pages i.e. page 3 in the PowerPoint presentation).
- Section for users to comment on the databases they have used and write potential tips for other users (on the individual database pages).
- Section for users to comment on whether something about a database is out of date or needs to be changed (on the individual database pages).

The information required for each database based on the user specifications can be seen in table 1 below.

Table 1: Information required for each database

Provide the following information for each database webpage searched:	Essential/Desirable:
Definitions of the data fields for each database and whether those fields are currently in use or have been changed over time.	Desirable (provide an overview of the data-fields in dataset)
Whether the data quality is checked within each database	Desirable
Warnings or information regarding the data held in the database	Desirable
What patient groups are covered within that dataset	Desirable
What variables exist in that database	Desirable
Potential data limitations	Desirable (users can have a section to make comments on the data limitations)
Which electronic systems are linked to which other systems	Desirable
Assigning keyword or terms to electronic systems listed	Essential
Contact name responsible for that database	Essential
Database names	Essential
How is the dataset managed	Essential
How often data is updated	Essential
How often is data collected	Essential
How old will the dataset be	Essential
How would we extract the data and who to contact for extraction	Essential
Information on how to use the system you are interested in	Essential
Information on key-fields covered in that dataset	Essential (provide an overview)
Is the data accessible for research	Essential
Location or where that system is used i.e. lab or wards	Essential
Time periods covered by that dataset	Essential
What data is available on that database	Essential (provide in a summary)
What level of information is held on that database	Essential
What the system is being used for currently and purpose of data collection	Essential
Where is the data stored	Essential
Who collects the data	Essential
Who has access to that data and restrictions on access	Essential
Who owns the database	Essential
Who to contact to speak about getting access	Essential
Who to contact to get more information about the database	Essential

Qualitative interviews summary of results:

- The main three sub themes that emerged were: **access of data** (and the barriers), **working with others** and the **organisational issues** (e.g. information governance and time constraint) that require consideration.
- The current undefined processes of secondary use of data within the Trust can result in a difficult and long procedure to gain access to data (this sometimes requires ethics which needs consideration).
- Key barriers that arose were what data is available, how to gain access (process of gaining access), knowing who to contact to access data, owner of the systems, requests for data retrieval and provide further information on the data that exists.
- Electronic data was deemed to be easier for reuse but it was thought the following things would make secondary use of data easier: if everything was available on one system and the system was self-explanatory. Technology therefore is a limiting factor and needs to be considered as it can be a barrier, however you also need to understand how to best reuse this data and individuals envisaged repurposing data to be difficult.
- There were two main sub themes identified within users' knowledge which would impact their ability to reuse existing electronic data: the knowledge of the data available and knowledge of how to use existing systems.
 - The users' knowledge of the data available was perceived to be critical step in reusing existing electronic data.
 - There was no defined method of identifying existing electronic systems and it was described as a time consuming and complex task to identify existing electronic systems.
 - Some individuals thought theoretically it was easy but practically difficult to identify existing electronic systems.

Appendix 3: User personas

Documents used to collate this information:

- NVivo analysis conducted on the 20 interviews for PSAQIM
- Stakeholder requirements document formulated based on the interview analysis
- Personal knowledge and experience around the barriers to secondary use of data (NC, MM, SG, JB, AT and BDF)
- Personal knowledge and experience after speaking to a range of stakeholders around this topic

Overview of the different types of users:

Table 1 presents the potential users who may benefit from using the Patient Safety And Quality Improvement Meta-data (PSAQIM) tool.

Table 1: Potential users of PSAQIM Tool

User Persona Number:	Professions of potential user groups:	Job titles:
1	Researchers	Clinical research fellow (ask Anthony)/PhD student
2	Nurses	Head of Department
3 & 4	Physicians	Trainee clinician & Consultant anaesthetist & trainee clinician in perioperative care
5	Pharmacists	Specialist/ Lead or junior pharmacist (audit)
6	Other allied healthcare professionals not listed above	Clinical governance Lead/ patient safety lead/mortality lead
7 & 8	Information regulators within organisations	Trust IT professional & Information governance rep/Caldicott guardian

User Persona Number 1:

Name: Sam Watkins

Occupation: Clinical research fellow/PhD student

Age: 25 years

Years in Healthcare: one year

Persona Description: This is a persona of an individual who works within research and is medically trained, has excellent IT skills and requires periodic extraction of data to analyse and support his research project. He wishes to use the data for surveillance and identify trends, what is happening locally, monitoring services and assessing the impact of other interventions implemented locally.

Background & Lifestyle: Sam is a full time postgraduate PhD student and is in a long term relationship. He lives in student accommodation at the university campus and loves to travel around the world.

Experience: Surgical research fellow & operational research

Primary common tasks: Research e.g. PAS records, surgical records

Attitude: Believes it should be easy to gather relevant information required for research purposes. Doesn't understand why the process is complicated in this generation where technology is widely implemented and commonly used.

Typical usage: Variable based on the project, he has a mobile phone and access to computers on the main site for research (i.e. remote access).

Common tasks: extraction of data from various systems such as electronic prescribing and PAS systems electronic system and identify who to approach to extract that data. What other data sets might exist that may be relevant for them.

What he/she need: A user-friendly and visually appealing meta-data source, a good search tool function to allow easy data identification using keywords and options to filter results to identify relevant datasets. Having information around the information governance concerns and ethics and understand the reliability of the dataset that exists and they wish to reuse.

User Persona Number 2:

Name: Maggie Smith

Occupation: Head of Pharmacy Department

Age: 59 years

Years in Healthcare: 35 years

Persona Description: This persona covers individuals who wish to reuse data on a monthly basis to help with reporting and monitoring their departments.

Background & Lifestyle: Works full time, is married and a mother of two. Travels 0.5 hour every day for work. Loves to spend time with her family and grandchildren.

DR NAVILA TALIB CHAUDHRY

Experience: Pharmacy, clinical and nursing services & Department/directorate level

Primary common tasks: Monitoring of quality and safety within department (assurance), needs access to finance data, sick leave records etc.

Attitude: Audit and research projects are essential part of her role. Lots of data exists, but it is hard to understand the information each system contains and how regularly the databases are updated.

Typical usage: Have reports already set up from local electronic system. Moderate and has a private office and two forms of technology available to her, a laptop and a desktop.

What he/she need: Knowledge about the data that exists within an organisation when new reports are asked to be produced on information she is not familiar with. Understand the limitation that exist within the datasets potentially compare databases across different departments who maybe performing better. Would like a small blurb containing key points about the data systems, ability to search database names using the departments they are used in, and view all the databases alphabetically so can scroll through the lists very easily. Wants a simple procedure for being able to apply for accessing an information system.

User Persona Number 3:

Name: Zahra Qureshi

Occupation: Trainee clinician

Age: 24 years

Years in Healthcare: first year

Persona Description: This is for a set of individuals who have good IT skills, have little knowledge of the organisation they are working within and has time constraints.

Background & Lifestyle: Works full time, is single and travels 0.5 hour every day for work. Travel often to various countries and works voluntarily with the orphans in need.

Experience: physiotherapy & front line/ in training

Primary common tasks: Audit and QI performing service evaluation as part of her training year and supporting the consultants she is working with. Need to be able to extract and analyse the data appropriately and understand what it is trying to say. Needs to be able to learn about expected quality of service from the data to model her own professional behaviour and understand variations in the data.

Attitude: Doesn't understand the disconnect between the electronic systems. Believes that technology is heavily incorporated in organisations and needs to be linked appropriately. Doesn't understand where to gather information around what types of information is available on the local datasets, how to analyse the information and what factors she might need to consider when analysing the data. Whether data is checked for quality or not.

Typical usage: Low

What he/she need: Needs a good summary of each database, and a simple to use meta-data tool. Requires useful links to important information which may help her analyse data appropriately, such as quality improvement tools, quality improvement case studies, implementation science resources, information governance and trust policies around data usage.

User Persona Number 4:

Name: Jane Hopkins

Occupation: Consultant anaesthetist

Age: 55 years

Years in Healthcare: worked in hospital 30 years.

Persona Description: These set of individuals do not interact much with any of the electronic systems within the organisation, have limited time to handle data and do not have great IT skills or knowledge.

Background & Lifestyle: Works full time, is divorced and a mother of one. Travels 2 hour every day for work. Loves to read and socialises in her local area with friends and neighbours.

Experience: Anaesthesia & front line clinical

Primary common tasks: Leading audit and QI and review of service performance amongst their team of professionals. Needs to be able to access and manipulate data in order to present summary of variations/performance at quality and audit meetings. Needs to be able to extract individual-level data to provide feedback to colleagues and provide support for clinician revalidation. Needs to be able to examine trends in quality of care for patient sub-groups in order to assess service quality and identify areas to discuss with colleagues/for remedial action.

Attitude: Doesn't need data often, but would be great to get more information about their personal performances. Wished all electronic systems were simple and easy to use and integrated rather than having to pursue a wild goose chase for information which should be freely available to all. Wishes the knowledge concerning how the data was collected, what it pertains to and other caveats in use was provided alongside the raw data, in order to support accurate appraisal of service quality.

Typical usage: Moderate

What he/she need: Understand how data is collected primarily. Have a simple help searching function which provides information on how to search the database and hat information is provided and where (example database page which provides details on all the database information). Information on how to use the meta-data tool, be easy to read and a good formatting. Needs rich contextual information (meta-data) in order to understand the clinical relevance of the data contained with databases. Needs to be able to edit meta-data in order to create a knowledge repository for how data can be accessed and used for clinical purposes.

User Persona Number 5:

Name: Michael Page

Occupation: Specialist/Lead pharmacist

Age: 30 years

Years in Healthcare: worked in hospital pharmacy for 5 years.

Persona Description: These individuals have good experience with local IT databases and knowledge of local departmental databases.

Background & Lifestyle: Completed a master's degree in pharmacy and Works full time, is happily married and a father of three. Travels 1 hour every day for work. Is very athletic and plays badminton on the weekends.

Experience: Pharmacist, specialising in antimicrobials

Primary common tasks: Participating in ward rounds, liaising with antimicrobial team and providing care for patients on the ward. Leading on audit and QI projects and review of service performance and comparing prescribing patterns across primary and secondary care. Accessing data on prescribing quality in order to identify medication order errors and use the information to provide feedback to clinicians and junior doctors.

Attitude: Knows great work is being conducted across the site within different departments, would be great to share experiences and information of what has been done already and allow better opportunities for collaboration and utilising the databases to their full potential.

Typical usage: Moderate

What he/she need: time constraints and job pressure therefore wants something which is relatively simple and easy to use. Wants to be able to filter the results based on the departments and locations used within and ability to edit search terms after search has been run.

User Persona Number 6:

Name: Harriet Goodman

Occupation: Clinical governance Lead/patient safety/mortality

Age: 45 years

Years in Healthcare: 20 years

Persona Description: These set of individuals have basic knowledge of how to operate electronic systems and has in depth knowledge of the types of analysis required. Has knowledge of the information governance and is involved in majority of the projects around patient safety in the organisation.

Background & Lifestyle: Works part-time as a job share, is single and travels 2 hour every day for work. Is very enthusiastic about information technology and loves swimming and yoga in her spare time.

DR NAVILA TALIB CHAUDHRY

Experience: Corporate directorship

Primary common tasks: Organisational performance and public reporting. Investigation of complaints/ mortality alerts and require information for clinical and general quality control and performance measurements.

Attitude: It is easier to operate electronic systems which are well integrated, it can save so much time and effort where information is linked and well-presented making it easier for staff to use the data and understand it better.

Typical usage: Moderate

What he/she want: A simple set of instructions for using the meta-data tool, understand the completeness of the data presented on each data set and have information of all the databases in one location. The ability to use a meta-data tool which has a feedback form for individuals so they can comment on the tool. Be able to state and contribute information to metrics about the quality of the data used.

User Persona Number 7:

Name: Ajit Kumar

Occupation: Trust IT professional

Age: 29 years

Years in Healthcare: 5 years

Persona Description: These set of individuals have great IT skills. They liaise with a variety of other healthcare professionals and require information about the information systems which exist within the organisation.

Background & Lifestyle: Completed a master's degree in information technology and works full time, is engaged. Travels 1 hour every day for work. Has a collection of comics and coins across different countries from his travels.

Experience: Support services in Trust ICT

Primary common tasks: Maintaining trust databases and infrastructure security & Regulatory compliance.

Attitude: The ability to identify relevant databases easily to answer queries from other healthcare staff members is essential. Everyone should have knowledge of the electronic systems which exist within the organisation. This would help him and his team with all the logged queries. The ability to update the contents as part of data management process and this should be controlled centrally so any changes made are known.

Typical usage: Frequent

What he/she wants: Wants a tool which present all the information about databases, who they are owned by and how to access them, how frequently they are updated, the types of information held

on each database. Have the ability to monitor data use by healthcare professionals in the Trust, so the healthcare professionals have the ability to add more detail about how data is used.

User Persona Number 8:

Name: David Johnson

Occupation: Information governance rep/Caldicott guardian

Age: 42 years

Years in Healthcare: 15 years

Persona Description: He is the Trust Caldicott guardian hence assesses his own organisation for the ways in which data used and whether it complies with the Caldicott guidance. He provides advice to all levels within the Trust, handles data protection enquiries, and produces new reports based on Trust needs (to enhance transparency around data use). Caldicott guardians report against an 18 point management audit tool to the Trust health boards and Department of Health.

Background & Lifestyle: Is single and has worked in the NHS for 20 years. He is IT literate, really good with technology and is up to date with technology. He loves to play computer games and sailing on the weekends. He owns a house thirty minutes away from the Trust.

Experience: Paediatrician who volunteered for the role of Trust Caldicott guardian

Primary common tasks: Ensuring IG guidance is up to date. Safeguarding patient data confidentiality and responding to queries concerning appropriate practice in data access and use.

Attitude: Believes information is not always being used in the most effective way. They get a lot of queries about the same thing and would like users to be able to better understand what data are available and how they may request access.

Typical usage: Frequent

What he/she wants: A tool presenting database information: who they are owned by and how to access them, how frequently they are updated, and the types of information held on each database. Be able to provide clear guidance on the information governance issues that may arise and commonly asked questions by healthcare professionals. The ability to check the different projects conducted within the organisation which has used electronic data. Monitor any concerns of issues individuals may be having as well as success stories through an interactive or feedback portal available to all healthcare professionals. The ability to check the different projects conducted within the organisations that have used electronic data. Register for notifications about data changes and meta-data updates and view relationships between data sources and how those relationships are used.

Appendix 4: Survey copy

The snapshots below present the survey that was produced on ICL Qualtrics and sent out to evaluate the PSAQIM tool.

PSAQIM Prototype evaluation survey

Welcome and thank you for agreeing to take part in this survey

This survey aims to evaluate the tool you have just piloted called Patient Safety and Quality Improvement Meta-data (PSAQIM). This prototype was primarily produced for healthcare professionals within the Imperial College NHS Trust hence your response would be invaluable to help guide and determine the effectiveness of this tool.

Your answers will remain confidential. The survey will take approximately 10 to 15 minutes to complete.

There are 3 sections to this survey:
1). General information about you
2). Questions relating to different sections of the tool (homepage, search results page and database information page)
3). General opinion of the tool

Thank you for your time, we really appreciate it. If you have any questions about this survey please feel free to contact us:

Mrs Navila Talib Chaudhry (telephone: 02075943105 email: n.chaudhry13@imperial.ac.uk)

What is your current job role?

- Doctor
- Pharmacist
- Nurse
- Allied Healthcare Professional
- Researcher
- Other

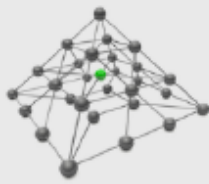
How long have you been in your current job role for?

- Less than a year
- 1-5 years
- 6-10 years
- More than 10 years

What department do you work in?

PSAQIM Screenshots have been provided below, please scroll down for further questions

Screen 1 - PSAQIM Homepage



Welcome to the new PSAQIM portal

This system is designed to enhance the re-use of routinely collected data to support initiatives to monitor and improve the quality care. The aim of this system is to:

- 1) Facilitate identification of relevant existing data sources for quality of care in your speciality area.
- 2) To aid the identification of and access to pre-existing data sources to support quality improvement.
- 3) Provide guidance on how to use routinely collected data to improve quality of care.
- 4) Capture learning and share experiences with colleagues concerning how to make better use of data.
- 5) Improve the accuracy of information on available data sources and their use in quality improvement work.

[How do I re-use data for quality improvement? Information and resources](#)

Let's get started!

Search for a database ..

Search

Community Feedback

Ratings

IMAGE

The new ratings allow you and other users to mark how helpful a database was for your area of work.

Comments

IMAGE

Users are now able to post short comments about PSAQIM.

Browse all databases by

- Database name
- Department
- Speciality


Your accessed databases

- JAC Medicines Management
- Aria E-Prescribing MedOnc Manager
- VitalSigns
- Astraia Foetal Medicine
- Keystone

[View all](#)

Helpful Links

- [Patient Safety First How To Guide for...](#)
- [QI made simple](#)
- [MUSIQ model](#)

 Give us Feedback!

Screen 2 - Search results page

Search our database...

9 Databases found

Sort By: Relevance

System class:

- CLINICAL_RESEARCH
- PAT_ADM

Data quality ratings:

1 2 3 4 5

Operational Status:

- OPERATIONAL

Number of Records:

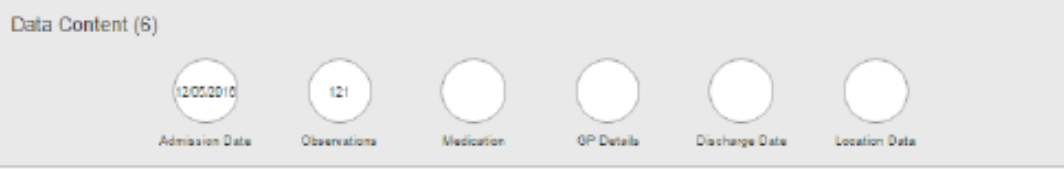
0 600

- Pharmacy Clinical Trials database v1** CLINICAL_RESEARCH
Last updated: 14 Jan 2001
Log of all pharmacy trials. Due to be replaced by version II...
operational linked 457 records 250 visits
- JAC Medicines Management** PAT_ADM
Last updated: 14 Dec 2015
Trustwide Pharmacy Medicines Management and Stock Control System. Used by all Trust pharmacies and L...
operational linked 457 records 250 visits
- ServeRx** PAT_ADM
Last updated: 14 Jan 2001
Pharmacy Cabinet Management System...
operational linked 457 records 250 visits
- OmniCell** PAT_ADM
Last updated: 14 Jan 2001
Pharmacy Cabinet Management System...
operational linked 457 records 250 visits
- MI Databank** PAT_ADM
Last updated: 14 Jan 2001
Database for recording pharmacy enquiries...
operational linked 457 records 250 visits
- Pyxis C11 Safe HH** PAT_ADM
Last updated: 14 Jan 2001
Pharmacy Management System...
operational linked 457 records 250 visits

JAC Medicines Management ★★★★★ 1 user comment
 Version 2.1
 Database Owner Name Operational Status Active Sensitive Data Format GET ACCESS

Description: Trustwide Pharmacy Medicines Management and Stock Control System. Used by all Trust pharmacies and Lloyds.

Location: Charing Cross hospital	Primary purpose: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua	Job roles with access: Oncologist, Pharmacist
Department: Oncology		This database is linked to: Database X and Database Y.
Speciality: Speciality Name		



User Comments (1) All versions (1) Current version (1) All Questions Sort By: Most Recent

★★★★★ by Pat P for Version 2.1 on 21 April 2016

What data did you use? The names and frequency of the non-formulary drugs dispensed prescribed and dispensed as well as the cost codes allocated to each item dispensed.

What purpose did you use the database for? To help enhance the use of formulary medication in line with the Trust guidance and help reduce cost.

Did you find the database had any limitations? Generic cost codes on the system are often used, which may not provide further information regarding the items that prescribe non-formulary medication. Potentially remove these cost codes to enforce correct data entry.

Please rate the following statements based on your view of the PSAQIM tool (pictures relating to the homepage, search results page and database information page have been provided above for our reference if needed).

	Strongly disagree	-	-	-	-	-	-	Strongly agree
The PSAQIM homepage clearly presents the purpose behind PSAQIM and how it will be useful to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The database search and browsing option (screen 1) are helpful in searching for databases that a user is interested in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information presented on the search results page (screen 2) is logical, clear and sufficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The detailed information presented for each database (screen 3) is useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The facility on the tool for users to comment on the database is useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The ability to complete a form to gain access to a database is useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

https://imperial.eu.qualtrics.com/jfe/form/SV_daNZMJN3RtdYs5

4/6

10/21/2016

Online Survey Software | Qualtrics Survey Solutions

	Strongly disagree	-	-	-	-	-	-	Strongly agree
The iconology across the whole tool was clear and easy to understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your opinion, to what extent does the tool achieve each of the following aims:

	Strongly disagree	-	-	-	-	-	-	Strongly agree
The PSAQIM tool will facilitate identification of relevant data sources in my speciality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The PSAQIM tool will provide sufficient guidance on how to use routinely collected data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The PSAQIM tool will capture previous experiences of reusing data by colleagues to help learn more about the data that exists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The PSAQIM tool will help enhance reuse of data for quality improvement and maximize the value of investing in data systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate the following statements based on your experience of using the PSAQIM tool:

	Strongly disagree	-	-	-	-	-	-	Strongly agree
The overall presentation and layout of the PSAQIM tool was satisfactory	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The guidance and database information provided within the tool was clear and presented in a helpful way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally the PSAQIM tool was easy to use, logical and allowed me to access the information I am interested in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The tool was easy to navigate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy to locate information on the tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the tool will be welcomed by healthcare professionals within the trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe there is a need for this tool within the Trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would use this tool in my day-to-day practice to support my quality improvement activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the tool will enhance the re-use of data for quality improvement purposes within the trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the tool has the potential to be effective in supporting broader quality improvement in the trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having used PSAQIM I would recommend it to my colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would improve PSAQIM by...

Thank you very much for completing this survey