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An Examination of the Levels of Confidence that Consultants have in Routinely Collected Clinical Information

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Anecdotal evidence suggests that consultants have a low level of confidence in routinely collected clinical data. However, there is little existing research evidence to support or refute these anecdotes. The main aim of this study was to assess the actual levels of confidence experienced by consultants in relation to clinical information and to gain a deeper understanding of what factors affect levels of confidence and why. A questionnaire was devised incorporating a scale to measure levels of confidence. This was disseminated to 506 consultants and achieved a 57% response rate. The confidence scale showed a good level of internal reliability (Cronbach's a > 0.7) and the influential factors were modelled using multi-linear regression. Consultant specialty, increased involvement in clinical coding and participation in service planning/monitoring all had a significant effect on confidence levels. A small number of semi-structured interviews were conducted to provide greater insight into why these were influential. Whilst, these findings confirm there is scope to increase levels of confidence, the mean score was approximately 50% of the maximum achievable indicating neither a high nor low level of confidence. The results demonstrated that many factors are involved in determining levels of confidence and improving consultants' confidence in information is complex and requires a partnership approach.

Keywords:
Clinical Data, Confidence, Health Information

1. Introduction

An increasingly large amount of effort and resource is being invested in the collection of clinical data throughout the National Health Service (NHS) in the United Kingdom. Much of this is in response to the implementation of National Service Frameworks (NSFs), which are long-term strategies to improve specific areas of patient care, and their corresponding information strategies [1]. A highly motivating and political driver also came from the recommendations of the Bristol Inquiry [2], an inquiry set up to investigate the management of the health care of children receiving complex cardiac surgery in the Bristol Royal Infirmary between 1984 and 1995. The report emphasised the need to audit and monitor clinical practice at a national level [2], further reinforcing the need for clinical governance, "a system through which National Health Service (NHS) organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish" [3, p.61]. In 2001, Halligan and

Donaldson stated “A health organisation establishing a culture of clinical governance must develop excellence in the selection, management, and effective use of information and data to support policy decisions and processes. For information and data to be useful they must be valid, up to date, and presented in a way that provides insight.” [4, p.1415].

Other major influential factors include the introduction of consultant appraisal and revalidation in 2001, the use of clinical data in the annual assessment of the performance and quality of all acute, specialist, ambulance, mental health and primary care units in the NHS in England [5], and the introduction of Payment by Results [6], by which organisations within the NHS pay and are paid for by the services they utilize and provide. Much debate has taken place regarding the publication of data on individual hospital consultants, or medical specialists, and Dr Foster, an independent organisation specialising in information about the quality and availability of health services, offers access to information about consultants on its website [7].

However, the most recent emphasis comes from NHS Connecting for Health (formerly known as the National Programme for IT (NPfIT)) [8]. This has at its core the development of the NHS Care Records Service (NHS CRS) where all relevant clinical data relating to an individual will be held for the NHS. It has been recognised nationally that this requires clinical input both to ensure the quality and accuracy of the data held and to promote their use for managing patients. The active engagement of clinical staff is considered to be fundamental to the success of this programme of work.

Management of large-scale clinical data flows is relatively new at a national level within the NHS, having previously concentrated largely on administrative and financial datasets. Previous experience of validating and quality assuring administrative datasets at both a local and national level suggests that even the most fundamental of data items relating to patients are not consistently and accurately collected [9]. In 2003, Tucker reported on how the NHS Data Accreditation scheme has begun to raise the profile of data quality amongst trusts, again largely at an administrative, rather than at a clinical, level [10]. Given this history, it is important to consider how the NHS in England expects to meet the information requirements for clinical management and clinical governance, and how data will be validated and the resulting information be of use to the clinical community in order to improve patient care directly. Assuming that the primary purpose of collecting clinical information is to improve care and consequently health and medical outcomes, it is important to understand the level of confidence that health care professionals have in the information to inform their everyday practice.

Clinical data collection in the field of cancer care in the UK has a different background to many other specialties. The national cancer registration scheme has existed for many years, and represented the first comprehensive collection of clinical data in cancer [11]. Cancer was also the first NSF and has its own information strategy [12]. The utilisation of cancer information in the UK continues to go through a major period of change, affected greatly by the development of the National Cancer Dataset (NCDS) [13], the National Clinical Audit Support Programme (NCASP) audits [14], the mandated collection of the Cancer Waiting Times (CWT) dataset [15], and the new cancer registration minimum dataset (CRMDS) [16]. All of these are having a tremendous impact on data collection methods and sources of cancer data throughout the NHS in England.

Much work has begun to collect data in accordance with the new NCDS but there is little information about how the data will be validated or quality assured. Similarly, there is no plan as yet for how data on the NHS CRS will be validated. As a result there is potential for vast amounts of data to be collected at great effort and expense without any understanding of the quality of the data. As previously suggested, if the quality of clinical data is not clear, then healthcare professionals will have little confidence in the data collected, and are less likely to use the information for day-to-day patient care, for monitoring and assessing the individual clinical or service practice.

The study reported here was set up to try and measure the current levels of confidence in clinical information for future comparison. While the purpose of this research was to allow the Northern and Yorkshire Cancer Registry and Information Service (NYCRIS) [17], which collects information about the 40,000 residents of the Northern & Yorkshire Health region in England (population 6.7 million) who are diagnosed with cancer each year, to gain further understanding of the levels of confidence which medical specialists have in data on cancer registrations, the findings are of interest to cancer and health care organisations in the UK, Europe and beyond for providing an understanding of the levels of confidence in other clinical data sources. It is hoped that the results may influence strategy for collecting and producing accurate, meaningful and useful, clinical information.

The overall aim of this study was to undertake a detailed examination of the levels of confidence that exist amongst consultants in relation to routinely collected clinical information. This included an assessment of confidence levels and further understanding of reasoning behind it. Consequently, the main objectives of the study were:

1. To develop and test a scale to measure confidence.
2. To assess how much confidence consultants have in routinely collected clinical information in the NHS.
3. To establish what factors are most important in determining confidence.
4. To explore in-depth, the reasons why these factors exist and are influential.

2. Review of the Literature

An extensive literature search of electronic health and medical databases and paper-based sources was undertaken to identify and review any research related to clinical information, data quality and related levels of confidence and whether there were existing research tools to measure levels of confidence in health information.

2.1 Confidence in Information

A number of articles selected for review made general reference to a lack of confidence or the need to improve confidence in information, however, very few made any attempt to quantify it or provide evidence to support it. This is consistent with the anecdotal perspective. In 2001, Hassey et al undertook to score aspects of data quality in general practice scientifically [18]. They concluded that these tests would enable health professionals to “measure the degree of confidence they can have in clinical coding” [18: p.1404].

Lawrence and Murray conducted an assessment of data quality issues as part of the Bristol Royal Infirmary Inquiry in 2000 [19]. They examined variations in data collection processes and also consultants’ perspectives on data quality relating to the UK Cardiac Surgery Register. The findings of this study suggested that whilst consultants expressed some element of confidence in their own data, there was an anecdotal lack of confidence in the overall register. It also highlighted issues around complexity of both diagnostic and multiple procedure coding, suggesting that both required clinical input. Lawrence and Murray identified a number of implications for the future, in particular recognising the difficulties of routinely collecting good quality clinical data. They suggested increased validation and feedback would help along with a widespread recognition of the role that non-clinical data collection and coding staff can play when working in conjunction with clinical staff. Paton [20] and Bloor and Maynard [21] both suggested further work was required in respect of data collection processes and data quality in order increase confidence in data and Cundy and Dear [22] reported that under-describing of clinical casemix “led to a very low level of confidence in the data by our clinicians” [22: p.31].

The Audit Commission has also been closely involved in measuring and monitoring data quality in the NHS over recent years. Data Remember highlighted many issues relating primarily to administrative data but also looked at clinical coding [9]. The findings of its review of corporate governance in public services reported a general lack of confidence in NHS information from the patient perspective [23] and most recently, it has published a three year review of information and data quality in the NHS which also refers to levels of confidence in data [24].

There is evidence of low confidence in Mental Health Trusts in the UK as well as the acute sector. The Mental Health Focus reported the results of the Commission for Health Improvement (CHI) 2002/03 Indicators in relation to data quality which saw 29% of trusts below or significantly below average, stating: “In some Trusts, it appears that clinical staff’s lack of confidence in information is justified. Substantial improvements in data quality are necessary to regain this confidence…” [25: p.3].

2.2 Factors Associated with Confidence in Information

Some of the literature has associated levels of confidence with specific issues. The most commonly referenced problem was poor data quality, which is a generic term for a number of different issues, for example, completeness, ascertainment, accuracy, validity and timeliness. Hassey et al produced a quantitative method of measuring some of these other aspects in relation to GP (General Practice/General Practitioner) data [18].

Two separate health technology assessments (HTAs) [26, 27] have looked at the use of routinely collected hospital data in support of randomised controlled trials (RCTs). Both reported shortcomings in relation to content and quality. Williams et al. concluded that “Routinely captured clinical data have real potential to measure patient outcomes, if the data were collected in detail and with precision.” [27: p.1]. One of their recommendations for further research was to gain a better understanding of clinicians’ attitudes to routine data as validity and availability improves.

Clinical coding was identified as an issue in many papers. Cundy & Dear developed a specific project around redesign of the clinical coding process in order to increase confidence in a health care Trust’s clinically coded data [22]. Lawrence and Murray identified specific issues related to the complexity and consistency of coding [19] and Gray et al [28] conducted an audit of coding practice in relation to diabetes across 17 General Practitioner (family doctor) practices, again identifying inconsistencies in practice. Closely linked to difficulties associated with clinical coding are the patients’ physical case notes. Warner [29] reported on the impact of using casemix as a means of budgeting on clinical coding, suggesting that it might be sensible for clinicians to do their own coding as their documentation drives coding accuracy, however, acknowledging serious implications for clinical time.

Many of the papers identified in the review related to specific sources of data, either family doctor practice, mental health, specific registers, although only Lawrence and Murray [16] and Warsi et al. [30] actually drew any comparisons across data sources.

2.3 Measuring Confidence

Finally the literature was reviewed for evidence supporting the methodological development of measuring confidence levels. Measuring attitudes or behaviour such as, “how do you feel?”, “what do you think?” is often complex and open to interpretation. Confidence can be measured by simply asking people “how confident do you feel about X?” or “how confident are you to do Y?”, but it can also be derived from behaviour patterns. This is often the method used in social and economic surveys, as behaviour can predict how confident someone is to do something. For example, confidence in the economy is usually derived from consumer spending habits. From the literature reviewed, only Lawrence and Murray made any attempt to measure or quantify levels of confidence [19]. They presented a series of statements to consultants via a self-assessment questionnaire. The responses were in the form of a Likert scale with five alternative answers.

The conceptual framework or model in Figure 1 was devised from the findings of the literature review and was informed by discussions with key stakeholders. It identifies the factors which may have a relationship with level of confidence, along with some standard demographic variables, and highlights where there may be relationships between factors.

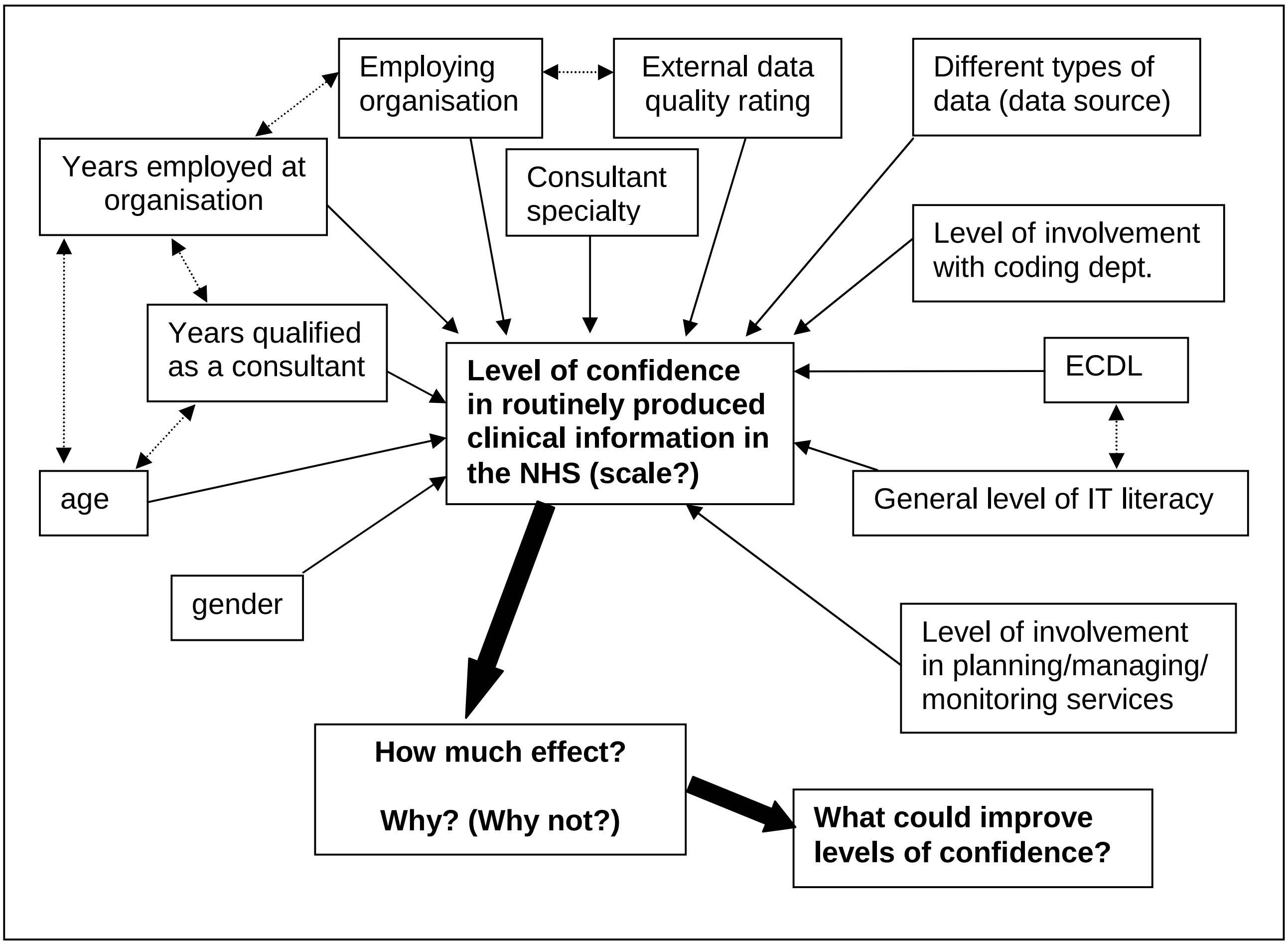

Figure 1: Conceptual framework for study. (ECDL = European Computer Driving Licence).

3. Methods

3.1 Methodology

Different research methodologies were evaluated looking at their suitability to meet the objectives of the study using the conceptual model. A "subtle realism" approach was taken allowing the combination of both quantitative and qualitative methods to be used in a form of "between-method" triangulation, as well as allowing for the inclusion of any a priori hypotheses. This methodology is often adopted in the area of health service delivery and organisation (SDO), as described by Fulop et al [31]. All ethical and NHS research governance requirements were taken into account and the study chose to concentrate specifically on the levels of confidence that exist amongst consultants managing cancer patients within the Yorkshire Cancer Network (YCN).

3.2 Questionnaires

A questionnaire was designed to take into account the measurable factors from the conceptual model. It was divided into three sections capturing personal characteristics, levels of health informatics experience and levels of confidence and use of different data sources. The questionnaire was designed to produce an overall "confidence score" using Likert scales which could be compared with the other variables. Due to the sample size required the study cohort was population-based. It was initially piloted with 10 consultants in one Acute Trust within the YCN before rolling-out to a cohort of 506 consultants (medical specialist), identified from the Northern and Yorkshire Cancer Registry and Information Service (NYCRIS) database, across seven Acute Trusts. The questionnaires were personally addressed and provided with a subject information sheet and pre-paid reply envelopes. Two sets of reminders were issued.

3.3 Semi-structured Interviews

A maximum of 20 semi-structured interviews were planned as part of the study to obtain further in-depth reasoning behind the results. Questionnaire respondents had to consent to be contacted for participation in an interview. The questionnaire responses were analysed and a "results profile" defined which matched against 19 potential interview candidates. 13 of these had consented to be interviewed. The interviews took place over the telephone and were recorded and transcribed for the purposes of analysis.

4. Quantitative Results

An overall response rate of 57% (n=289) was achieved. This ranged from 62% to 50% across the seven Acute Trusts. Four questionnaires were excluded due to incomplete responses, leaving 285 questionnaires available for analysis.

4.1 Measuring Levels of Confidence

Section Two of the questionnaire contained four questions designed to capture responses which could be scored to measure levels of confidence. Cronbach's Alpha was used to assess the internal reliability of the scales for each of these four questions independently and combined. The four questions combined achieved a Cronbach's Alpha greater than 0.7 (a = 0.86), suggesting a high level of internal reliability. The values within Confidence Score approximated to a normal distribution, allowing it to form a continuous outcome variable for regression analysis.

4.2 Assessment of Levels of Confidence

The Confidence Score had a mean value of 79.4 (95% Confidence Intervals (CI) = 77.4,81.4), and ranged from 12 to 133. The mean value represented 50% of the maximum achievable score of 160.

Scores were summed across questions to create a confidence score for each data source out of a possible 15. Pathology data had the highest mean confidence score of 12.6 (95% CI=12.3, 13.0) with CHKS data scoring the lowest, 5.9 (95% CI: 5.7, 6.1) (CHKS is a healthcare company specializing in bench-marking health care providers in the UK). Each of the data sources were assessed separately for variation in ranking across Trusts. Six Trusts scored Pathology and Patient Administration System (PAS) data as first and second respectively, and the remaining Trust which scored PAS then Pathology. All Trusts scored HES (Hospital Episode Statistics) and CHKS data as eighth and ninth respectively, except one Trust where Oncology was eighth and CHKS was ninth. Figure 2 presents the mean confidence score for each data source.

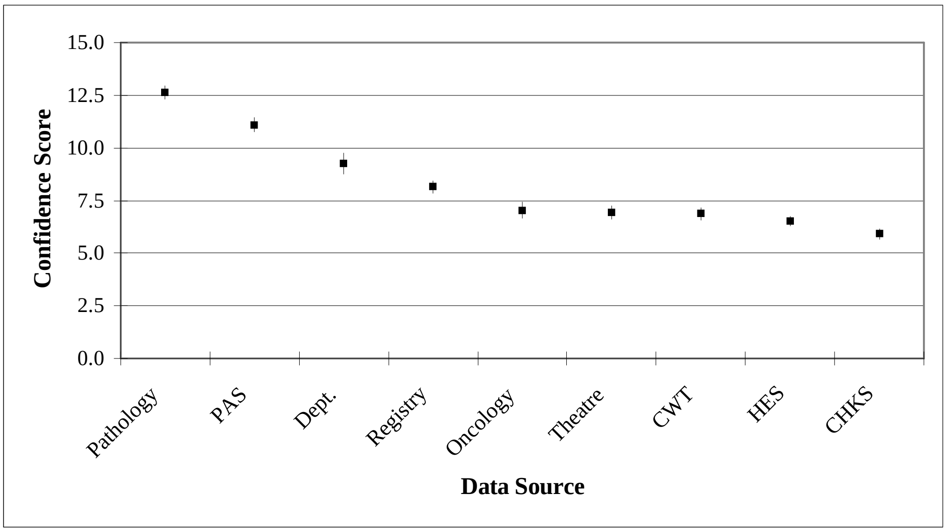

Figure 2: Mean confidence score by data source

4.3 Factors affecting levels of confidence

The effect on level of confidence was measured for each of the identified factors. Table 1 presents the results of the single linear and multiple linear regression which was conducted to estimate the effects of the covariates on the dependent variable of Confidence Score. Each of these independent variables was entered separately into a simple linear regression model to identify whether there was a significant relationship with the dependent variable. Those variables that had a significance of $p>0.100$ (medical specialty; management score; coding score; health informatics score) were then entered into the multiple linear regression model using a forced entry method of variable selection.

Three variables remained significant predictors of level of confidence in routinely collected clinical information. Consultant specialty continued to have the largest effect with an increase of 9.9 (95% CI=2.34, 17.64) in Confidence Score for oncologists compared with physicians. Whilst this factor remained significant after adjusting for other factors ($p=0.033$), the estimate does have wide confidence intervals due to the small number of oncologists in the category. Each additional management role undertaken continued to result in an increase of 2.76 (95% CI=1.10, 4.43) in Confidence Score (p=0.001), and increased involvement in clinical coding resulted in an increase of 1.48 (95% CI=0.92, 2.03) in Confidence Score for each additional unit in Coding Score ($p<0.001$). The effect of Health Informatics Score was no longer significant after adjusting for other factors.

However, the combined effect of these three factors, consultant specialty, management score and coding score only accounted for approximately 16% of the variation that exists in Confidence Score (Adjusted $R^2 = 0.161$). This model leaves a remaining 83.9% of the variability in confidence levels unaccounted for, suggesting that there could be other unidentified factors remaining, in addition to any random variation.

Variable	(reference group)	Univariate Analysis Estimate	95% CI	*p*-value	Multivariate Analysis Estimate	95% CI	*p*-value
Acute Trust	**(Airedale)**			0.161*			
	Bradford	0.68	-9.16, 10.52	0.892			
	Cald. & Hudd.	-5.00	-14.93, 4.93	0.322			
	Harrogate	4.53	-7.78, 16.85	0.469			
	Leeds	-5.28	-14.02, 3.45	0.235			
	Mid Yorkshire	-7.05	-16.46, 2.36	0.141			
	York	-3.10	-13.25, 7.04	0.548			
No. of years at Trust		0.07	-0.23, 0.37	0.665			
Female	**(Male)**	3.10	-2.21, -8.05	0.252			
Age Group	**(30-39 years)**			0.286*			
	40-49 years	4.52	-1.18, 10.22	0.120			
	50-59 years	1.26	-4.79, 7.31	0.682			
	60+ years	-0.70	-11.50, 10.10	0.899			
Years as consultant	**(1-5 years)**			0.170*			
	6-10 years	5.92	0.56, 11.28	0.031			
	11-15 years	0.19	-5.66, 6.03	0.950			
	16-20 years	4.15	-2.28, 10.58	0.205			
	21 years plus	3.41	-3.79, 10.61	0.352			
Specialty	**(Medicine)**			0.003*			0.033*
	Surgery	3.08	-0.99, 7.16	0.138	2.39	-1.44, 6.20	0.221
	Oncology	13.24	5.61, 20.86	0.001	9.99	2.34, 17.64	0.011
Management Score		3.96	2.35, 5.57	<0.001	2.76	1.10, 4.43	0.001
Coding Score		1.50	0.92, 2.07	<0.001	1.48	0.92, 2.03	<0.001
Health Informatics Score		0.37	-0.02, 0.77	0.065	0.26	-0.11, 0.63	0.169
Data Quality Score		1.73	0.89, 4.36	0.194			
Information Governance Score		0.77	-0.73, 2.28	0.310			

* *p*-value indicates overall significance for the variable.

Table 1: Results of Simple and Multi-linear Regression

5. Qualitative Results

Question 12 of the questionnaire asked consultants to suggest three things that could increase their level of confidence in clinical data. A total of 466 suggestions were made and these were categorised and coded, yielding 31 different categories in total. Table 2 presents the seven most frequently occurring categories, which accounted for approximately 50% of all suggestions.

Using the results from Question 12 combined with the results of the quantitative analyses, a profile was created for identifying a purposive sample of study subjects for participation is a short semi-structured interview. 19 participants were identified, 13 of which had consented to take part in an interview. A total of seven telephone interviews were conducted across four Acute Trusts, with lack of time available to consultants being the most common reason for interviews not taking place.

Table 2: Top seven suggestion categories for increasing levels of confidence

Suggestion Code/Category		**n**	**% of responses**
2	Routine validation/audit/reports for checking	58	12.4
10	Increased accuracy/reliability	33	7.1
12	More modern/user friendly/single system	33	7.1
16	Coding and/or direct data-entry by clinical staff	33	7.1
7	Proper support/resource (staff/time/systems)	28	6.0
11	Improved liaison/communications between IT/information and clinical staff	28	6.0
13	Increased access/easier access to systems for clinicians	27	5.8

5.1 Thematic Analysis

The interview questions were already focused on particular subject areas, therefore, the thematic analysis was conducted in relation to each question, although some general themes did emerge across all questions.

The results provided insight into why pathology data scored the highest, largely due to confidence in the pathologists themselves as professionals and the clinical reliance on correct pathology data for patient management. The views regarding PAS data were more varied with nearly as many comments relating to good data quality as poor data quality. It was felt that one reason why PAS may have scored well could be due to general increased familiarity and experience, good or bad.

The cancer registry data were ranked lower than pathology, although the registry is highly reliant on pathology data. When explored, this was largely due to a lack of understanding of the registration process and perceived lack of access to the data. HES and CHKS data were ranked the lowest of the data sources, although both are derived directly from PAS data (ranked second). The reasoning behind this is largely based on perceived poor data quality but also relates to their non-clinical and possible inappropriate use and interpretation.

Exploring the reason why it would be beneficial for clinicians to carry out clinical coding helped to identify that clinicians do not necessarily need to do the coding themselves but need to work closely with those people that do. This may be by identifying the procedures and diagnosis clearly in the case notes, or meeting on a regular basis with coders to review cases or by carrying out routine audits of coded cases. The main reasons for this clinical input are based on the complexity of many cases, especially in medicine, and also the increased likelihood of accuracy the closer a clinician is involved in the care of the patient. A number of questions asked about the use of lists/reports for routine audit with only one interviewee receiving any kind of routine list for checking. However, five out of the seven said they would be prepared to carry out this kind of audit/checking more often.

Four cross-cutting themes were identified. It became clear that most people's perceptions were based on personal experience (or lack of). Therefore, direct exposure to data allowed clinicians to build confidence and positive experiences could only be increased by increasing access/exposure. Another theme emerged around acceptance of an appropriate error level. There is not a general expectation that data will be 100% correct, but that there is a perceived acceptance level, probably about 95%, but this could vary according to data source.

Five of the interviewees referred to their own independent source of data collection at a personal or departmental level. The collection of many of these data sources is driven by professional bodies, but could be supplied through more routinely collected data if the clinicians had sufficient confidence in their quality. The final cross-cutting theme was around the influence of other roles. Four of the interviewees referred to their roles as clinical leads, chairs of Trust groups or members of committees. This reinforces the quantitative results regarding increased confidence by virtue of alternative managerial roles.

The interview responses provided data which are not able to be obtained via a more quantitative approach. The two sets of results were triangulated in relation to each question. This allowed the fourth objective of the study to be met which was to gain further insight into why particular factors were influencing levels of confidence and which of these factors are the most important.

6. Discussion

One of the main objectives of this research was to assess how much confidence consultants have in routinely collected clinical information. The literature review identified a number of references to low levels of confidence but there were few attempts made to measure or quantify them. The results of this study show that out of a maximum score of 160, the mean confidence score was approximately 79, representing almost exactly 50%. Therefore, it may be possible to conclude that in this case consultants have expressed neither low nor high general levels of confidence. This finding supports statements referring to the need to increase levels of confidence [17] [18], as clearly there is room for improvement. However, whether this finding could support more anecdotal descriptions of general low levels of confidence would very much depend on the definition of "low". The scale developed to measure confidence levels had a good level of internal reliability (a = 0.86).

The other key objectives were to consider what factors influenced confidence levels and why. A number of factors were identified from the literature along with local considerations and standard demographic variables. The findings of this research confirm that confidence levels vary significantly between data sources, showing that out of the data sources identified for this study, pathology and PAS data were rated the highest and HES and CHKS data the lowest. The qualitative results obtained through a small number of interviews provided further evidence, suggesting that pathology data were highly regarded due to experience of high quality data, confidence in the pathologists, the importance of the data in relation to patient care and frequent exposure to the data via pathology reports. Given the reliance that consultants have to place on pathology results it would have been unlikely for them not to have high levels of confidence in it. On the other hand the low levels of confidence expressed in HES data were directly related to experiences of poor data quality and perception of its purpose. The responses did not clearly explain the reason for variation between PAS and HES data, given that for most Trusts these represent the same data source. There was an element of misinterpretation of HES, with some interviewees relating it to their local data and some relating it to national data.

Out of all the factors assessed, very few had a significant effect on predicting increased levels of confidence. The factors which were significant individually were consultant specialty, increased involvement in clinical coding, increased participation in service monitoring/planning and increased health informatics experience. After adjusting for each other, health informatics experience became non-significant with a small estimated effect. The interview responses gave some good insight to the possible links between health informatics experience and levels of confidence. Increasing health informatics skills provides an additional means of accessing information and potentially increases use and confidence, however, it is possible that increased knowledge can confirm existing views of poor systems and data, and therefore reduce levels of confidence. It is also possible that individuals who are interested in information and data quality are also more likely to be IT literate. This confirms the observation made by the NHS Information Authority (NHSIA) [32] that little is known regarding the effects of increased health informatics skills and that further research is required in this field.

The effect of consultant specialty on confidence was not identified explicitly through the literature but when combined with the qualitative results may begin to identify limitations and difficulties in clinical coding associated with different specialties. However, one possibility may be that oncologists reported higher levels of confidence as some of the data sources were particularly related to cancer care and may be accessed more frequently. In addition, the introduction referred to the increased resource that has been made available for data collection and development of data standards in relation to cancer but there is no baseline against which to establish whether this increase in resource has already resulted in a corresponding increase in confidence. These results could suggest that recent investments may be beginning to make an impact on confidence levels for oncologists.

For medicine and surgery the issue may lie in the limitations of the coding systems to represent their patients accurately. Surgeons had a higher level of confidence than physicians which could be due to the ability to record procedure codes more accurately than diagnostic codes. When asked why consultants wanted to carry out clinical coding themselves, the main theme identified was related to complexity of coding and the need for clinical input into the decision-making, but also some recognition that it was different for procedures and diagnoses. This may also explain the effect of specialty on confidence score. This reference to complexity of coding is consistent with Lawrence and Murray’s findings [16], and also supports the views of Cundy and Dear [19] and Warner [26], that involvement of clinicians in the clinical coding process is required to obtain a greater depth of coding. Increased involvement in coding may be achieved via direct links with a clinical coder or through regular validation of lists. These results show that any form of increased involvement is likely to increase levels of confidence.

The interviews enquired explicitly about the extent to which case notes affected data quality and all agreed that they were highly important, referring to issues of missing notes, missing results and general state of repair. Only one interviewee raised a potential lack of discipline by doctors to communicate clearly in the case notes as a factor. Warner referred to the crucial role played by case notes in relation to high quality data capture and coding [29]. Whilst copies of discharge summaries should find their way into case notes, consultants possibly need to consider the role that routine handwritten notes can play in improving clinical coding.

The final significant factor was increasing involvement in service planning or monitoring by virtue of another role over and above practising consultant. The roles identified in the questionnaire were limited to those related to cancer services. As a result a number of consultants who held other positions, such as Clinical Director, would not have those reflected in their data. It was decided to look at the overall effect of undertaking different service management roles, irrespective of what precisely they might be. There was a significant effect on levels of confidence in relation to increased management score. Again this was not explicitly identified in the literature, however, Paton did recount his experience of increased knowledge and learning in his capacity as Medical Director [17]. Clearly not every consultant neither can nor would want to undertake additional roles, however, it may be important for those who do to share their experiences and information more widely amongst colleagues.

One of the key suggestions made by consultants for improving levels of confidence was increased audit, validation and feedback. When investigated further, there was little consistency about what format this should take. There appeared to be a desire to audit and validate but there were mixed views about whether this should be at individual patient-level, exception reporting or through provision of useful and meaningful information which can be questioned if necessary. This seemed to be dependent on time available and volume of patients. There is clearly a role for information and/or audit staff to work with consultants and their teams looking at what information would be useful to them on a more routine basis.

These results go some way to quantifying levels of confidence and identifying how and why they might vary. However, the quantitative results show that these factors only account for a small proportion of the variation in levels of confidence, leaving the rest unaccounted for, although due in part to random variation.

6.1 Study Limitations

A number of possible limitations were identified relating to choice of methodology, research tools, analytical techniques and researcher bias. The choice of a "subtle realism" methodology suited this study, however, it can lead to broader coverage of a subject at the risk of losing subject depth. One design limitation of the questionnaire meant that respondents could tick the same column in the Likert Scale for every question in Section Two rather than consider each response. The small number of interviews meant that the thematic results could not be generalised and even though a 57% response rate was achieved for the questionnaire, the 285 responses still produced wide confidence intervals for some analyses. Thematic analysis is a very time consuming process and should be factored into all study designs to ensure sufficient time is available. There was also a possibility of researcher bias through links with the cancer registry, and external reference points were used wherever possible. All of these limitations were taken into account and steps had been taken to ensure that the effects of these were minimised during the study.

6.2 Generalisability of Results

Care was taken with the study design to ensure the results could be as generalisable as possible. The population-based approach to the study cohort ensured that no sample bias was introduced, however, it is not known to what extent the responses represent the whole cohort. It is assumed that the YCN represents a typical cancer network. Some of the data sources identified were specifically related to cancer and therefore the overall levels of confidence could not be assumed for all consultants. However, cancer care does cover many specialties. The results for the non-cancer specific datasets such as PAS may be more generalisable. The quantitative results would not be directly transferable to the primary care setting, however, some of the qualitative results may be more generalisable. The responses derived from a small number of interviews cannot be applied to the general consultant population, although they helped to gain further understanding of the issues and may be transferable to other clinical specialties and settings.

7 Conclusions

This study set out with the overall aim to examine the levels of confidence that consultants have in routinely produced clinical information in the NHS. The context for the research identified a variety of increased demands for clinical information within the NHS and anecdotal evidence that consultants have a low level of confidence relating to the use of that information. It was suggested that a greater understanding of what affects levels of confidence was required in order for resources and expertise to be concentrated in those areas likely to make the greatest impact.

The number of respondents and the study response rate of 57% permitted meaningful statistical analyses. The scale devised to measure levels of confidence in information was based on a Likert scale and proved to have good internal reliability (Cronbach's Alpha = 0.86). The mean confidence score was 79 out of a maximum 160. This score varied according to a number of factors and single variable and multiple variable regression was carried out to construct an optimum model for effect on confidence score. Consultant specialty, increased involvement in coding and increased participation in monitoring or managing services were all significant predictors of level of confidence. However, they only accounted for approximately 16% of the variation in confidence levels in total. The qualitative results emphasized the importance of perception based on experience, identifying a larger number of negative experiences reported than positive ones. They also suggested that many factors were influential in defining levels of confidence, and that they were about having confidence in people and processes, as well as IT systems and data quality.

7.1 Key Messages

A number of key messages have emerged from the study, in particular the complexity of measuring factors relating to human behaviour, and the complex nature of increasing levels of confidence in data and information. The study concludes with a set of key messages for policy makers, the Trust Board, information/audit teams, IT departments, clinical coding teams and consultants. These are based around the importance of prioritising the information governance agenda both politically and financially, reinforcing the need for a collaborative approach across teams rather than "silo" working and breaking down barriers based on perception, being open minded and willing to contribute to achieve overall success.

7.2 Further research

This research adds additional evidence to a small existing evidence base. Further research is required to measure levels of confidence either in related or other areas for comparison. For example, it would be informative to know whether confidence levels were higher in other areas where considerable work has taken place in relation to data collection and quality, for example, in cardiac surgery. Levels of confidence in data in primary care would also be interesting due to a large amount of the data being coded directly by General Practitioner (GPs) or family doctors during consultation. This could further inform the debate about the level of clinical involvement required in clinical coding.

This paper suggests that increasing levels of confidence is not the responsibility of one person and that it requires a partnership approach. Confidence in information is not just about measuring data quality. Whilst IT and information are seen largely as scientific disciplines, the use of IT and information are fundamentally human issues related to psychology and behaviour. It is about perception and experience, building relationships and trust, and increasing familiarity with information, people and processes. This cannot be forced but requires a collaborative approach by all parties involved to make it work.

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