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Nurses' views of using computerized decision support software in NHS Direct

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Background. Nurses working in NHS Direct, the 24-hour telephone advice line in England, use computerized decision support software to recommend to callers the most appropriate service to contact, or to advise on self-care.

Aims. To explore nurses' views of their roles and the computerized decision support software in NHS Direct.

Methods. Qualitative analysis of semi-structured interviews with 24 NHS Direct nurses in 12 sites.

Findings. Nurses described both the software and themselves as essential to the clinical decision-making process. The software acted as safety net, provider of consistency, and provider of script, and was relied upon more when nurses did not have clinical knowledge relevant to the call. The nurse handled problems not covered by the software, probed patients for the appropriate information to enter into the software, and interpreted software recommendations in the light of contextual information which the software was unable to use. Nurses described a dual process of decision-making, with the nurse as active decision maker looking for consensus with the software recommendation and ready to override recommendations made by the software if necessary. However, nurses' accounts of the software as a guide, prompt or support did not fully acknowledge the power of the software, which they are required to use, and the recommendation of which they are required to follow under some management policies. Over time, the influence of nurse and software merges as nurses internalize the software script as their own knowledge, and navigate the software to produce recommendations that they feel are most appropriate.

Conclusions. The nurse and the software have distinct roles in NHS Direct, although the effect of each on the clinical decision-making process may be difficult to determine in practice.

Keywords: NHS Direct, nurse, computerized decision support software

Background

NHS Direct is a 24-hour telephone advice line staffed by nurses that covers England and Wales, and a similar service called NHS24, covers parts of Scotland. Nurse advisors use computerized decision support software to offer triage recommendations and self-care advice to the general public over the telephone, on a wide range of health problems. Triage recommendations are typically to self-care, contact a general practitioner immediately or later, or attend an accident and emergency department urgently or as an emergency using a 999 ambulance. Callers have reportedly found the telephone advice helpful and reassuring (O'Cathain *et al.* 2000) and there is evidence that it has halted the upward trend in use of out-of-hours general practice services (Munro *et al.* 2000).

Telephone triage services are available in many countries, including Australia, New Zealand, Canada, United States of America (USA) and Denmark. Calls can be taken by doctors, for example general practitioners triage patients in their out-of-hours services in Denmark (Christensen & Olesen 1998), but telephone triage is more commonly carried out by nurses. Some examples are an ophthalmic accident and emergency service in the United Kingdom (UK) (Marsden 2000), an after-hours paediatric service in the USA (Poole *et al.* 1993), and a province-wide helpline in Canada (Robb 1996). NHS Direct is innovative because it has been established on a national basis, is available 24 hours a day, and deals with all health problems across all age groups. Similar services are under development in Australia (Turner *et al.* 2002) and New Zealand (St George & Cullen 2001).

Evidence is accumulating about the types of nurses working in NHS Direct (Morrell *et al.* 2002), their perceptions of their new role (Knowles *et al.* 2002), how they manage the absence of visual cues during the telephone consultation (Pettinari & Jessopp 2001), and the effects of training (Payne *et al.* 2002). However, little is known about the respective roles of the nurse and decision support software during the triage process. At one extreme, the software might drive the decision-making process with the nurse acting as little more than a computer operator. This may prompt the question of whether it is necessary to employ nurses at all, as non-clinical personnel use software to prioritize calls and offer first aid advice for emergency ambulance services (Clawson & Dernocoeur 1988). At the other extreme, the nurse might act as an autonomous decision-maker, with limited reference to the software, thus questioning the need for such software. Research on the ways in which nurses use standardized protocols in telephone triage suggests that they do not necessarily standardize care (Wachter *et al.* 1999) and that nurses vary in the extent to which they use standardized protocols (Mayo *et al.* 2002). It has been suggested that deviation from protocols may be desirable rather than a shortcoming, and that further research is needed on experienced telephone triage nurses using protocols (Rutenberg 2000). In addition, concerns have been expressed that the term 'telephone triage' does not adequately communicate the nurse's role of caregiver and decision-maker, and that there is potential for this care-giving role to be rendered invisible by the use of protocols (Wilson & Hubert 2002). There is expected growth in the use of computerized decision support systems by nurses in NHS Direct and walk-in centres in the UK (Salisbury *et al.* 2002), and in accident and emergency departments in the UK (Department of Health 2001). Hence, it was timely to explore nurses' views of the clinical decision-making process in NHS Direct so as to understand the respective roles of nurse and software.

The study

Setting

There were 17 NHS Direct sites established throughout England during 2000 that employed approximately 1000 nurses. Each site used one of three computerized decision support software systems. One used algorithms, each with a set of predetermined questions, to assess callers' symptoms, and provide a triage recommendation for the nurse. The second used guidelines based on a decision tree principle and provided a triage recommendation for the nurse. The third used guidelines that prompted questions and drew attention to critical symptoms, but did not impose a fixed triage recommendation on the nurse. During 2001 these systems were replaced by a fourth decision support software system called the NHS Clinical Assessment System. This was implemented as the national standard system across all sites

in England and provided triage recommendations for the nurse. In the scenario of a caller presenting with a high temperature, the nurse might enter a relevant algorithm or guideline of 'fever', ask the caller a series of set questions, enter the callers' answers and then consider the software recommendation.

Participants

The study was conducted during 2000. We selected 12 NHS Direct sites, four using each of the three software systems, and asked managers from each site to give consent forms and information sheets to four nurses, two with a background of working mainly in the community and two with a hospital-based background. We chose one community nurse and one hospital nurse to interview in each site. In two sites, we visited and directly asked nurses to complete consent forms.

Forty-eight nurses were approached, 43 agreed to participate and 24 nurses were interviewed as planned. Nurses had a mixture of clinical backgrounds, and between 4 and 30 years clinical experience, with two-thirds of nurses having 10 or more years of experience. The mean length of time worked in NHS Direct was 13 months, ranging between 4 and 24 months.

Data collection

Two interviewers (AOC and FS) each undertook interviews with four nurses using each system. We designed a semi-structured interview schedule to establish nurses' views of the software they used, influences on the clinical decision-making process, and how they used the software in reaching decisions about the recommendation to give to callers. Interviews took place at NHS Direct sites in private. They took an average of 40 minutes, ranging from 30 to 50 minutes. The interviews were tape recorded and transcribed verbatim.

Ethical considerations

Multi-centre Research Ethics Committee approval was gained for the study. Information was given to participants and consent obtained as described above.

Data analysis

We undertook framework analysis (Richie & Spencer 1994), using Winmax software (Kuckartz 1998). AOC and FS read a sample of the transcripts and identified a preliminary list of themes, some of which were determined by the study objectives and some of which emerged from the data. We both coded a further sample of transcripts according to the thematic scheme to refine the coding prior to applying the scheme to all the transcripts. The content of each theme was considered, that is the sub-themes, and the relationships between themes. AOC charted themes relevant to the roles of the nurse and software for half the nurses. KJT and JFM challenged and discussed the content of, and relationship between, these themes. AOC returned to the uncharted transcripts to validate the findings.

Findings

The essential software

The nurses welcomed the presence of the software as essential to the clinical decision-making process. Even a nurse who expressed highly negative views about the lack of 'user friendliness' of their software did not want to work without it. In fact, only one nurse, who had extensive experience in triage without computerized decision support software, felt 'quite confident assessing without it'. Nurses described the role of the software as that of a safety net, provider of consistency, and provider of script. They felt that the software ensured that they gave safe advice by considering all potential health problems and recommending the safest, most appropriate outcome, but also offered safety for the nurse by providing justification for, and documentation of, the advice offered.

I think it's imperative that we have software. (N19)

It's a safety net for the patient and a safety net for me. You know I don't want anything to go wrong, obviously I don't want the patient to suffer as a result. (N9)

Nurses were aware that they had different clinical backgrounds and felt that the software helped to provide consistency of advice between different nurses. Because of the wide variety of health problems they dealt with, nurses felt that they did not know how to deal with all health problems and relied on the software where their experience or knowledge was limited. The software structured their discussion with patients by prompting them with questions, offering them a script to elicit the relevant information from the patient.

I think there needs to be some sort of software to be able to give safe advice and consistent advice. Because we've all come from different areas, and we've all learned different things, some of it's not evidence based if you leave it up to the individual. (N5)

But I think that we all have areas that we are not 100% on. And I think then you go with what the system says. (N14)

The software gives you the relevant questions to ask. (N2)

The essential nurse

The nurses believed that, although necessary, the software was by no means sufficient. Some health problems were not covered by the software, or could not be located by the nurse during their consultation with the caller, leaving the nurse as autonomous decision-maker. Further, they felt that the software was sometimes unable to consider contextual or other relevant information such as chronicity of health problem and past medical history. In these circumstances the nurse interpreted the software recommendation in the light of information the software could not process.

It works for me to a point. There are times when I have to use no guideline. (N6)

Patients are all individuals and they will say something that doesn't fit in with the software […] it's only, it's a standard, it's a set of standards, it doesn't take into account individuals. (N12)

You cannot put people, people do not fit into little boxes, and everyone presents with questions but they are all different, and I think it would be hard if I had to say to someone 'oh well, you know, you need to go to casualty because the computer told me I have to send you'. (N17)

Nurses commented on the difficulty of making decisions without face-to-face contact with the patient. The lack of visual cues meant that they had to rely on asking questions, and their listening skills, to visualize the patient and their problem (Pettinari & Jessopp 2001). Nurses were aware that the information patients gave them could be unreliable or partial and that what they heard, as well as what they were told, contributed to their mental picture. Further, they felt that they had to ask the right questions and probe the patient to 'find the truth' because different callers could give very different impressions of symptom severity, with some patients appearing to exaggerate symptoms and others to underplay them.

You don't have the advantage of seeing the patient, you don't have the advantage of taking their temperature, doing their blood pressure this kind of thing. So you're not only listening to the words they are saying, but the connotation of what they are saying, how they are saying it […]. And you are building up a mental visual picture of this patient all the time speaking to them on the phone. (N18)

Like I was saying about the chest pain could be indigestion, it's going to flash up saying chest pain. When you start really digging into it they say 'oh yes well I've just eaten a banana and I've been lying down'. (N10)

Dual triage

Nurses viewed the software as a tool, prompt or support, and felt that the nurse made the clinical decisions. They described a dual process of decision-making, in which they actively assessed the patient's problem independently of the software, as well as through prompting from the software. Four nurses used the vivid metaphors of 'monkey' and 'robot' to describe anyone who used the software without applying what they termed 'critical thinking'.

The nurse's own knowledge and experience complements really. The software we use as a guide if you like, we try and build on that with our own experience. (N21)

I think also the nurse needs to remember that the software is there as an assessment tool. The responsibility and the accountability for the outcome of that call and the end point delivered is always there. So they really need to make sure that the critical thinking, the clinical ability, communication skills are acute on every single call. Because otherwise you'd just sit trained monkeys in front of the computer terminal wouldn't you. (N18)

The nurses felt that the level of agreement between nurse and software during this 'dual triage process' was generally high, and when there was disagreement nurses could intervene to override the software recommendation by 'upgrading' to a higher triage level or 'downgrading' to a lower level. This ability to override contributed to their view that they were making the decisions, with the software in a supporting role. This description of the 'active nurse' seemed to be an ideal to which nurses aspired, but which did not always occur. One nurse felt that she took a less active role in the decision-making process during busy periods, especially when there was an outbreak of influenza, because of the monotony of repeatedly taking similar types of calls.

But the good thing about it is that you can use your nursing knowledge and judgement to actually change the endpoint as necessary. (N9)

[…] such as over the Christmas period […] the amount of calls is just phenomenal, absolutely phenomenal [...]. And often they are very similar, and I think sometimes you know you may lose that, you may lose your actual concentration and that could show in your results, I mean that's only an opinion. But you end up 'I better have a rest because I'm just not, I'm not thinking while I'm doing it and I'm just going through the motions'. [...] it's like doing constant bed baths. All the time, something like that, you know never stopping all day. A nurse doing an injection, after injection, or whatever and never changing. (N8)

The power of the software

The nurses acknowledged the usefulness of the software, and indeed its essential role, but their description of it as a 'tool' or 'prompt' understated the powerful influence of the software in

the decision-making process. Nurses were required to use the software whenever possible, whether they welcomed this or not. When first using the software, nurses described it as interfering with their consultation with the patient, leading either to dependence on, or avoidance of, the software.

I use it, I have to go through it, because you know if you don't go through [the algorithms] we get our knuckles rapped. (N23)

In the early stages if somebody used to phone up and say they were short of breath or they'd got chest pain [...]. I wouldn't get as far as triaging them [...] it's a matter of trusting the software. (N11)

We all use it [the software] as a bible for the first six months. I really did. (N16)

This sense of interference disappeared over time as nurses gained experience in using the software or learned to trust it, but it remained for calls in which nurses had relevant clinical expertise and felt that the software limited their ability to use their own knowledge.

I think that because it's actually quite prescriptive and quite directive, that it, it limits your scope for professional knowledge and your ability to use your clinical judgement. (N5)

A further sign of the authority of the software was the limitation on the nurse's role imposed by management policies in some sites, which either prohibited nurses from downgrading software recommendations or encouraged individual nurses not to stray too far from the standard pattern of recommendations within the site.

The company won't allow us to downgrade [the software recommendation]. (N7)

Achieving consensus

When asked about the ideal relationship between software and nurse, a common response was that they should 'agree', 'match', or 'reach a consensus'. This language supported the idea of a dual process of decision-making by nurse and software, and the desire for consensus seemed to emphasise that the software was seen as more than simply a 'tool'.

Interviewer: What do you think is the ideal relationship between the software and the nurse?

Nurse: Obviously when they match. (N12)

…usually it comes to the same decision as I was planning. (N16)

Consensus could be achieved in ways that were not necessarily visible to the nurse or to those managing the service. As the nurses acquired the knowledge and script of the software, they seemed to internalize it as their own knowledge, feeling in control of the decision-making process when in reality they may have been repeating a learnt script from commonly used guidelines and algorithms. Further, as their knowledge of commonly used guidelines increased, they became able to select the guideline they entered and the routes they took through the software system to ensure that the eventual software recommendation would match their own. In this way, nurses attempted to manage clinical risks for the patient while also minimizing their personal risk by giving advice consistent with the software recommendation. This progressive integration of nurse and software rendered the influence of the software invisible to the nurse, and the influence of the nurse invisible in the software record.

[The software] is there really to reinforce what you are going to say [...]. Once you've used the system a few times, you know what questions it's going to bring up, so you can already have asked it before it comes to that stage. (N7)

There are certain things I would never ever do no matter what the algo[rithm] indicated. And it wouldn't indicate that in my case [...]. I know how the chest pain algo[rithm] goes [...]. I know that's going to give a high end point straight away. (N15)

Interviewer: When a decision is reached about the disposition to recommend to the caller, can you tell me what contributes to that decision?

Nurse: Almost certainly the guideline. No doubt about that. It's too hard to offer an accountable decision without using the guideline or somehow making the guideline work for you. (N3)

Discussion

The influence of the nurse and the decision support software merge to the degree that it is difficult to determine the effect of each on recommendations given to NHS Direct callers. Nurses feel that both the software and the nurse are essential to clinical decision-making, and describe a process of 'dual decision-making', with the nurse as active decision maker looking for consensus with the software recommendation. Nurses influence clinical advice explicitly by dealing with calls which the software cannot handle or overriding the software recommendation, and implicitly via the information they glean from the caller and the way in which they choose to navigate the software. Their description of the software as a tool, prompt or support does not fully acknowledge the powerful influence of the software, which they are required to use, and the recommendation of which they are required to follow under some management policies. Over time, merging of influence takes

What is already known about this topic

- There is increasing use of computerized decision support software in the NHS, for example in NHS Direct and walk-in centres.
- Little is known about how health professionals view the contribution of such software to the clinical decision-making process.

What this paper adds

- NHS Direct nurses felt that both the software and the nurse are essential to the decision-making process, describing a process of dual decision-making, with the nurse as active decision-maker and the software as a tool, prompt or support.
- Nurses are required to use the software and, although they can override the software recommendations, they are required to follow these recommendations under certain management policies.
- Over time the influence of nurse and software merge as nurses internalize the software script as their own knowledge, and navigate the software to produce recommendations that they feel are most appropriate. This can make it difficult to determine the effect of each on recommendations given to callers to NHS Direct.

place as nurses internalize the software script as their own knowledge, and navigate the software to produce recommendations that they perceive to be most appropriate.

These findings are consistent with those reported in the wider context of computer–human interaction, for example aircraft pilots and air traffic controllers who work under similar temporal constraints and risks as NHS Direct nurses (Hoc 2000). Such studies have highlighted 'integrative' cooperation between computer and human, where agents have distinct but complementary types of expertise, and where there is the possibility of some redundancy of human skills. They have also noted the importance of mutual control, where the user reasons in parallel with the system and a search for consensus is undertaken when there is disagreement, an approach which may help to avoid complacency on the part of the human. In the context of telephone nurse triage, studies have shown that computerized protocols are not necessarily comprehensive (Brillman *et al.* 1996), that nurses take the roles of picture-builder (Edwards 1998, Pettinari & Jessopp 2001) and inquirer (Edwards 1994), and that different nurses choose different protocols and can arrive at different endpoints using the same protocols (Watcher *et al.* 1999).

It was surprising that we did not find more discomfort or dissatisfaction with the software. Previously, doctors have argued that the use of protocols to aid evidence-based practice result in loss of clinical autonomy (Tanenbaum 1994), and that there is potential for an inappropriate shift in authority from the patient or the clinician to the guideline (Rogers 2002). This may be due to the software being an integral part of working in NHS Direct, or a 'survivor effect' if nurses who are unhappy working with software leave the service, or that nurses can gain autonomy from the use of protocols (Manias & Street 2000).

Study limitations

We included a variety of nurses in the study, ensuring they had a range of length and types of experience outside NHS Direct, and a range of length of experience of telephone triage within NHS Direct. We felt that the sample included typical NHS Direct nurses but may have been biased towards those considered by their managers to be 'good nurses'. However, positive views of the software, and a belief that they participate in the clinical decision-making process, were also widespread in a survey of all NHS Direct nurses (Morrell *et al.* 2002). Additionally, we relied on the nurses' accounts of their role, in which they may have presented themselves as 'good NHS Direct nurses'. We did not encounter the minority of NHS Direct nurses who claim to be bored with their work (Knowles *et al.* 2002), nor those who have left NHS Direct, so our findings are not necessarily transferable to all NHS Direct nurses.

Finally, we have explored nurses' views of software in a service where they cannot see the patient. These findings may not be transferable to services where nurses have face-to-face contact with patients, such as those in walk-in centres or accident and emergency departments.

Conclusion

The evidence presented here suggests that recommendations in NHS Direct result from a process of decision-making in which both nurse and software play a distinct role. When dealing with some calls the contribution of the nurse may far outweigh that of the software, and in others the reverse may be the case. The process of 'dual triage' which occurs, and the attempt by nurses to find a consensus between themselves and the software, may be a positive feature of the system which enables better decision-making than might occur otherwise, although this remains to be shown empirically. A progressive

merging of nurse and software influences seems inevitable and probably desirable. However, there is probably more to be learnt from studying any points of friction in the system than from accepting apparent consensus between nurse and software.

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