

The effect of skill-mix on clinical decision-making in NHS Direct

A report for West Midlands NHS Executive

June 2001

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ISBN: 1 900750 99 6

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Abstract

Background

NHS Direct, the 24 hour telephone advice line staffed by nurses, started operation in three pilot sites in March 1998. In January 2000, when this study was funded, there were 17 sites covering 60% of the population of England. All the sites provide triage advice to callers about managing their health problems. This advice is typically to self-care, to contact their GP immediately or later, or to attend A&E urgently or as an emergency (via 999). In February 2000, when this study began, the sites employed a variety of different types of nurse and used one of three computerised decision support software, one highly prescriptive (Access), one interpretive (TAS) and one in between (Centramax).

Objectives

To determine whether there are any differences between nurses with different lengths and type of clinical experience in the pattern of advice offered to callers with health problems, and to determine whether any such differences between nurses are consistent between the three types of software in use. To understand nurses' views of the underlying processes which lead nurses, supported by their software, to provide particular types of advice.

Methods

A quantitative study was undertaken to determine differences in the advice given by different nurses. Routine data on calls triaged in April 2000 were requested from the 17 NHS Direct sites in operation. Information about the length and type of clinical experience of nurses taking those calls was obtained from individual nurses or human resource records in these sites. These data were analysed using log linear modelling in GLIM, adjusted for case-mix. A qualitative study was undertaken to explore the underlying processes in clinical decision-making in NHS Direct. Face-to-face semi-structured interviews were undertaken with 24 nurses with different clinical backgrounds, and using different software. These data were analysed using framework analysis in WinMax.

Results

The data consisted of over 80,000 triaged calls and nurse information on over 400 nurses in 13 NHS Direct sites. Adjustments were made for case-mix in terms of the age and gender of the patient and the time of the call. The type of software had the largest influence on the triage advice, with Access disposing 36%, Centramax disposing 30%, and TAS disposing 44% of calls to self care. Differences in triage advice between types of nurses were smaller than differences between software and differences between individual nurses. Nurses with less than ten years clinical experience were less likely to dispose calls to self care than nurses with more than 20 years clinical experience (34% v 40%). This difference existed for all three types of software. There was weak evidence that nurses with different clinical backgrounds gave different patterns of advice overall.

Nurses felt that the software was an essential, but not sufficient, component of the clinical decision-making process. They felt that they applied critical thinking during calls because the software did not cover all health problems or all the circumstances specific to individual patients. Thus the nurses perceived that they influenced the triage advice to callers, and influences included the nurse's experience in terms of length, type and variety of clinical experience, experience in NHS Direct, and life experience; external aids such as colleagues' clinical experience; and issues specific to the call such as age and anxiety level of patient, and availability of services. However, the direction of any influence on triage advice was unclear.

For example, hospital nurses felt that they treated calls more seriously because they had experienced patients with serious conditions, or less seriously because NHS Direct callers had minor ailments compared with their previous experiences. There was evidence that the way in which nurses arrived at a recommendation might differ, in that community nurses might allow callers' social circumstances to influence the recommendation more than other types of nurses, and that *specialist* knowledge and experience related to a call influenced the recommendation. There was a suggestion that the levels of confidence or risk aversion of nurses might influence the recommendations they gave.

Conclusions

The advice given by NHS Direct nurses may be influenced by the length of their experience, with nurses with extensive clinical experience disposing more calls to self care. However, this factor has little impact on the pattern of disposals *overall* particularly when compared with the influence of the software and the variation between individual nurses. The challenge facing NHS Direct is to ensure the appropriateness of the software recommendations. Further research into the effect of the nurse on clinical decision-making should take a more focused approach on the effect of the specialist skills and experience of nurses, and their approach to risk-taking during clinical decision-making.

Acknowledgements

Many thanks to the staff at the NHS Direct sites participating in this study. They provided data and information during a very busy period in the life of NHS Direct.

Many thanks to the nurses who agreed to be interviewed and who gave so freely of their views.

This study was presented at a seminar programme held by the Department of Public Health Sciences at St George's Hospital Medical School. The audience made useful comments about both our analysis and interpretation. Stephen Walters and Professor Mike Campbell offered further advice about multi-level modelling. We are grateful for these inputs but take full responsibility for the analysis presented.

We are grateful to the NHS Executive West Midlands, in collaboration with the Nursing and the Research and Development Directorates, for funding this project.

The work was undertaken by the Medical Care Research Unit which is supported by the Department of Health. The views expressed here are those of the authors and not necessarily those of the Department.

1. Introduction

1.1 NHS Direct

NHS Direct, the “new 24 hour telephone advice line staffed by nurses”, started operation in three first wave sites in March 1998. In January 2000, when this study was funded, there were 17 sites covering 60% of population of England. Currently there are 22 sites covering the whole of England. All the sites provide information, for example about local health services, and also provide advice to callers about managing their health problems. This advice is typically to self-care, to contact their GP immediately or later, or to attend A&E urgently or as an emergency (via 999). The three first wave sites have undergone extensive evaluation,^{1,2} showing that callers find the advice helpful and usually follow advice,³ and that there has been little or no impact on demand for other services.⁴

1.2 Potential sources of variation in NHS Direct triage advice

During a preliminary assessment of the operation of the three first wave sites, we found some evidence that sites were advising callers in different ways.¹ For example the proportion of calls that resulted in advice to contact a GP either immediately or later varied from 58% to 32%. This difference between sites may have arisen for a number of reasons:

1. Differences in **case-mix**. Differences in the underlying clinical case-mix of the callers could arise, for example because the populations served differ, or the populations use different services for some calls in some areas, or some calls are re-directed from other services such as A&E or GP co-operatives.
2. Differences in the computerised decision support **software** operated by the three sites.
3. Differences between **nurses**. Differences in the level and nature of experience of the nurses.
4. Differences in the **setting**. Differences in the context in which NHS Direct call centres operate, that is whether they are based in A&E departments, GP co-operatives, or ambulance control centres, and differences in the availability of and access to other services could lead to different advice.

Nearly all of the variation in the advice reported by callers remained when the case-mix was held constant in a pilot experiment in which the same set of 119 urgent calls originally made to ambulance services was presented to nurses at each of the three first wave sites.¹ This suggests that differences other than case-mix, such as the setting or nurses or software, are more important than the case-mix.

1.2.1 Differences between software triage systems

Three computerised decision support software were used by the 17 sites in operation in January 2000: seven sites used the Telephone Advice System (TAS) of Plain Software, five used the Centramax system of HBOC (Centramax), and five used the Personal Health Advisor of Access Health (Access). These three systems differ in many regards, and one of the most important is the degree to which they provide support for the clinical decision of the nurse advisor. TAS is a support system providing interpretative advice to the nurse, whilst

Access is a binary branching algorithm which, if followed, leads inevitably to the same recommended outcome, although whether or not the nurse passes that recommendation on to the caller is still a matter of clinical judgement. Centramax takes an approach between these two. This distinction is analogous to that between guidelines and protocols, and closely parallels the difference between the two triage software systems used by UK ambulance services one of which is prescriptive and is required to be adhered to as in a protocol (AMPDS) whilst the other is more loosely constructed and suggests questions which need to be asked (CBD). When these two systems were reviewed by the Medical Care Research Unit we noted that the advantages of the flexible guideline approach had to be set against “the need for experienced and well trained dispatchers able to make more responsible decisions”.⁵

1.2.2 Differences between nurse advisors

The 17 NHS Direct sites in operation in January 2000 employ a variety of different types of nurse, for example with backgrounds in community nursing, paediatrics, A&E, and general practice. It is clearly possible that the nature of experience, and the level of the experience of the triage nurses may affect the decisions that they think are appropriate. Indeed, a Canadian study of 50 transcripts of nurse telephone triage in emergency medical services, without the use of software support, showed that decision-making accuracy was related to the length of nursing experience, with accuracy rates higher in nurses with ten or more years nursing experience than in nurses with less experience.⁶

1.2.3 Differences in outcome for nurse x software combinations

Although the decision support software may tend to dilute any differences between nurses, the advice that is offered to the caller still comes from the nurse, and many of the transcripts of calls that we have reviewed confirm that the nurses have an important role in interpreting the advice of the software. The extent to which differences between nurses are reduced by the software may of course depend on the type of software - whether it is supportive or prescriptive.

1.2.4 Other differences

The variety and accessibility of other health services which are available locally may affect the advice given by the NHS Direct nurse. In very rural areas with large distances to A&E or other health services we might appropriately see an increased tendency to self-treatment. Where GP Co-operatives do not operate there may be a tendency to use A&E services out-of-hours more readily. Equally, the context in which the NHS Direct service operates may have some influence. Services based in Ambulance dispatch centres, or A&E departments, or GP co-ops may be more (or less) inclined to rely on these services for professional care for callers who need help than would other services.

1.3 Skill-mix requirement for NHS Direct

NHS Executive West Midlands, in collaboration with the Nursing and the Research and Development Directorates, invited researchers to investigate the skill-mix requirements for NHS Direct. They were particularly interested in the *optimum* level of training and experience required for NHS Direct nurses and how the software interacts with level of training and experience of nurses. They wanted to test the hypothesis that software with more explicit guidelines optimised quality when used by less experienced nurses with extensive training, and that software with less explicit guidelines optimised quality when used by experienced

nurses with minimal training. They wanted ultimately to inform the development of a staff competency framework for NHS Direct nurses and contribute to developing the best configuration for any software in use. They suggested an approach to the research which included observation and/or simulation to allow calls to be assessed against a *gold standard*.

1.3.1 Using consistency rather than appropriateness as a gold standard

In response to the above invitation, we proposed a study to examine the differences in outcomes between sites in terms of types of nurse and software. It is natural to imagine that there is some gold standard against which the actual advice which is offered can be compared. Unfortunately in the absence of hard evidence on costs and effectiveness, the ideas of 'appropriate', 'better', etc. can only be judged against the opinions of other 'experts' in an expert clinical panel. An alternative method is to study the *consistency* of advice. A lack of consistency between nurses and/or software in the advice provided would lead us to question whether some advice about a particular reported problem is better or more appropriate than other advice, and hence whether some types of nurse or software lead more often to better advice. Thus we did not propose to assess what is 'right', but rather only to assess the consistency of advice provided by different types of nurse using different types of software. Clearly if this advice is consistent then it will be reasonable to assume that it is in some sense optimal. Only if it is inconsistent will questions arise as to what is best. The NHS Executive accepted that consistency of advice would be an appropriate gold standard.

1.4 Objectives

With the above considerations in mind, the primary objectives of the research were to

1. determine whether there are any differences between different types of nurse in the pattern of advice offered to callers with health problems
2. determine whether any such differences between nurses are consistent between the three types of software in use, or whether they depend on the type of software

and the secondary objectives were to

3. estimate the magnitude of the differences in the patterns of advice recommended by the three types of software
4. comment on the consequences for health services of any differences in nurse x software combinations which have been found
5. make a qualitative assessment of the underlying processes which lead to nurses, supported by their software, providing particular types of advice.

2. Methods

A quantitative study was undertaken to determine whether there were any differences in the advice given by different nurses, and a qualitative study to explore nurses' perceptions of the underlying processes in clinical decision-making in NHS Direct. Ethics committee approval was obtained for all 17 NHS Direct sites.

2.1 Quantitative study

The 17 NHS Direct sites in operation were approached to participate in the study. Sixteen sites agreed to participate and one site chose not to participate due to their heavy workload in expanding their population coverage.

2.1.1 The data

We requested two sets of data from each site:

1. **Anonymised software log data** on all triaged calls during April 2000: date of call, time of call, age of patient, gender of patient, disposition, and code of nurse who had taken the call. These data were supplied by 15 of the 16 sites that had agreed to participate. One site could not provide the data without the help of Plain Software, and Plain Software wished to charge £500 to retrieve the data. Data were cleaned of all duplicate call records, non-triaged calls, and calls relating to the same episode.
2. **Nurse information** on nurses who had taken ten or more calls in the dataset above. The following variables were chosen based on the objectives of the study and hypotheses derived from the interviews with nurses:
 - a. Length of clinical experience. Total number of years worked in jobs for which a nursing qualification was required.
 - b. Type of nurse. The last job held prior to NHS Direct for which a nursing qualification was needed. That is, *immediate* past experience.
 - c. Range of experience. The number of jobs in different specialties held for more than a year, excluding training. For example, a nurse working as an E grade in A&E and an F grade in a different A&E has one specialty, and a nurse working for two years as a hospital nurse and six years as a district nurse has two specialties.
 - d. Length of time in NHS Direct. Number of months worked in NHS Direct. This was adjusted to length of time in NHS Direct in April 2000.
 - e. Gender of nurse.

Sites were given three options for obtaining the nurse information. First, by asking nurses to complete a proforma with instructions, second by asking their Human Resources Departments to complete a proforma, and third by asking nurses to sign their names next to their nurse code to give us permission to access data collected in a previous survey of nurses.⁷ The majority of sites chose the first option. The information was provided in time for the analysis by 14 sites. However, in one of these sites the calls had been coded incorrectly by being allocated to nurses and health information staff who had not taken the call. This site was excluded from the analysis, leaving 13 sites.

2.1.2 Adjusting for case-mix

The comparisons we wished to make may be affected by differences in the case-mix presented by callers and also by differences in service setting between sites. One consequence of any differences between the service setting is that comparisons between types of software, which depend on comparing groups of sites which use each type of software, are always (potentially) confounded with them even if the case-mix is standardised. Consequently, even if the case-mix is standardised, it is still necessary to compare clusters of sites when comparing software. On the other hand, comparisons between types of nurse can be made 'within site' and these comparisons should therefore be free of any case-mix and service setting bias (so long as for example particular types of call are not targeted at particular types of nurse). A further consequence of this is that with some reasonable assumptions about other interactions, estimates of any nurse x software interaction should also be free of confounding due to site differences.

The severity and type of health problems dealt with by NHS Direct are not easily retrievable from NHS Direct software log data. Therefore we used the age of patient (child 0-14, adult), gender of patient (male, female) and time-of-day (in-hours Mon-Fri, out-of-hours) to adjust for case-mix. This information was available for 12 of the 13 sites included in the analysis.

2.1.3 Expected sample size

Assuming a typical call rate of 100 per 1000 population per year, we expected an average of 10,000 to 15,000 calls per site per month. Since the sites employ on average about 40 full or part-time nurses, we expected data on outcomes for about 300 calls per nurse.

2.1.4 Disposition and triage

Our outcome was the 6-category disposition of calls: A&E via 999 ambulance, A&E, GP immediately, GP routinely, self-care only, and other service. This allowed us to identify the consequences of any differences in triage advice for the different services to which callers are disposed. However, another important issue to consider was the consequences of any differences in the prioritisation or triage urgency of calls. Therefore we collapsed the 6-category disposition variable into a 3-category triage urgency variable - high (999, A&E, GP immediately), moderate (GP later, other service) and low (self care) for additional analysis.

2.1.5 Analysis

The data from each site were reduced to the same set of categorical variables to explore the original objectives and further hypotheses developed during the qualitative study:

Original objectives

software (3 levels)

site (13 levels)

age of patient (2 levels: child 0-14, adult)

gender of patient (2 levels: male, female)

time-of-day (2 levels: in-hours Mon-Fri, out-of-hours evenings and weekends)

disposition (6 levels: A&E via 999 ambulance, A&E, GP immediately, GP routinely, self-care only, and other service)

triage urgency (3 levels: high=999, A&E, GP immediately; moderate=GP routine and other, low=self care)

length of clinical experience (3 levels: <10 years, 10-19 years, 20+ years)

type of clinical experience (2 levels: hospital, community)

specific type of clinical experience (10 levels: A&E, intensive care, other hospital, practice nursing, health visiting, school nursing, district nursing, other community nursing, paediatrics, midwifery)

Further hypotheses

number of specialties (2 levels: <3, 4+)

length of time in NHS Direct (2 levels: <6 months, 7+months)

gender of nurse (2 levels: male, female)

The analysis strategy was difficult to determine because we had a 6-category partially ordinal outcome variable (disposition) based on calls nested within individual nurses, nested within sites, nested within software. Multi-level modelling seemed the obvious approach to take but would not allow us to maintain our 6-category outcome variable, which we were particularly interested in. In addition, many of the variables under study, such as software and nurse type, are fixed effects and the simpler nested approach was therefore used. The log-linear contingency table approach is appropriate for categorical outcome variables, but would not allow us to take account of the hundreds of individual nurses. Thus we have analysed the data using two separate approaches:

- 1) a log-linear contingency table analysis using GLIM.⁸ The log-linear models are fitted to a set of tables of counts of calls defined by the case-mix (age x gender x time of day), the sites (and hence software) or the nurse characteristics, and the outcome that is the disposition of the calls. The disposition is treated as an outcome by ensuring that the model used to explore the data always includes all the interactions between all the explanatory variables. Models with the majority of terms did not fit the data (indicating over-dispersion) and consequently tests were based on F-ratios calculated from the change in deviance per degree of freedom from adding a term, and the residual deviance per degree of freedom.
- 2) a multinomial regression approach using SPSS. This approach allowed the fitting of a nurse-level variable as well as case-mix adjustment. The outcome modelled was the 3-category triage urgency because the 6-category disposition would not run in SPSS. Since the nurses are nested within software and also within nurse types, a conventional nested design ('split-plot') analysis, based on appropriate F-ratios, was used. Results from these analyses are summarised in Appendix A.

2.2 Qualitative study

The qualitative study was undertaken to understand the underlying processes which lead to nurses, supported by their software, to provide particular types of advice. However, as well as offering insights into the clinical decision-making process which would help us to understand the findings of the quantitative study, it was used to generate hypotheses about further influences on clinical decision-making which could be explored within the quantitative analysis.

2.2.1 Sampling technique

Our plan was to take a purposive sample of 24 nurses using the three types of software, with short or long experience of community or hospital nursing, who had been working in NHS Direct for at least 3 months.

Fifteen of the seventeen sites agreed to participate in the qualitative study. One site did not participate in the study at all and one site was undergoing managerial change and wanted minimum participation. We selected the four Access sites, the four Centramax sites, and four of the seven TAS sites to ensure that all software were represented across different sites. We felt that eight interviews for each software would allow us to look at similarities and differences for different software, but would not allow us to make a definitive study of the attitudes and methods of working between different nurse x software combinations.

We asked directors and managers from these sites to give consent forms and information sheets to four nurses, two with a community background and two with a hospital background. If all consent forms were returned, we chose one community nurse and one hospital nurse to interview. During interviews we noted that the nurses were likely to have managerial responsibilities, an interest or experience in research, or degrees, suggesting a tendency to select a particular type of nurse to be interviewed. In order to ensure a wide range of views, in three sites we asked managers to nominate nurses who did not fall into these categories. In one of these sites, and in a further site, we visited the site and directly asked nurses to complete consent forms. A further assessment of our sample showed that we were interviewing nurses with many years of experience and in addition we asked managers to nominate nurses with shorter experience.

2.2.2 Interviews

Two interviewers (AOC and FS) each undertook 12 interviews, with four nurses from each software. We designed a semi-structured interview schedule to establish nurses' attitudes to the software they use, influences on the clinical decision-making process, and how they use the software in reaching decisions about the advice to give to callers (see Appendix B). All interviews took place at NHS Direct sites in private rooms with no one else present, except in one site where interviews took place in a quiet area of the call centre. They took an average of 40 minutes, ranging from 30 to 50 minutes. The interviews were tape recorded and transcribed verbatim.

2.2.3 Analysis

We undertook framework analysis,⁹ using the software Winmax,¹⁰ to examine whether there were any underlying themes relating to attitudes and methods of working which might help illuminate the quantitative analysis and interpretation. This involved reading and summarising the transcripts, identifying a preliminary list of themes emerging, and coding each transcript according to the thematic scheme. Further reading of the transcripts helped to identify sub-themes within each theme. Two researchers (AOC and FS) discussed the development of the themes and sub-themes during this process.

3. Results: Variations in clinical decision-making

3.1 Response rates

We obtained 143,061 triaged calls (Table 3.1). However, calls were incorrectly allocated to health information staff and nurses by one site and could not be used in the study, and the nurse information was not supplied in time for the analysis by another site, leaving 118,981 calls. Another site provided the age and gender of the caller rather than the patient and could not provide the correct information due to a changeover in the software used. Therefore 12 sites were included in the analysis when case-mix adjustment for age and gender of patient was made.

We obtained nurse information for 401 of the 636 nurses who triaged ten or more of these calls. Of the 636 nurses, 115 had left NHS Direct, were on maternity leave or were agency nurses and could not give their details, giving a response rate of 77% (401/521) of nurses. The response rate in terms of number of calls was 68% (81232/118981). One site could not provide the length of clinical experience of nurses, leaving 11 sites in the analysis when studying length of clinical experience with case-mix adjustment.

3.2 The outcome variable

The outcome variable used in the log-linear models was the triage advice given by the nurse i.e. the disposition. An additional outcome used was this 6-category disposition collapsed into a 3-category triage urgency variable. Overall, calls were disposed mainly to self care (38%) or GP immediately (29%), with a relatively small proportion disposed to 999 or other services (Table 3.2).

Table 3.2 Number (percentage) of calls by disposition

	Number	(%)
<u>Disposition</u>		
999	1658	(2.0)
A&E	7372	(9.1)
GP immediately	23392	(28.8)
GP later	15372	(18.9)
Self care	30553	(37.6)
Other	2885	(3.6)
<u>Triage urgency</u>		
High	32422	(39.9)
Moderate	18257	(22.5)
Low	30553	(37.6)
TOTAL	81232	(100)

Table 3.1 Data availability by site

Site	Software	Records provided	Non-triaged calls	Duplicate records	Nurse field missing	Relevant records	Number of nurses with >=10 calls	Nurses with information available	Records with nurse info available
A	Access	7412	2447	0	0	4965	41	20 (49%)	2907
B	Access	8161	1323	2	0	6836	36	29 (81%)	6099
C	Access	18893	4400	0	0	14493	Calls allocated to nurses incorrectly		
D	Access	Did not participate							
E	Access	5056	1722	0	0	3334	41	23 (56%)	2060
F	Centramax	14232	3130	26	0	11076	53	30 (57%)	6960
G	Centramax	10154	544	23	0	9587	Information not provided on time		
H+	Centramax	6090	165	7	0	5918	40	40 (100%)	5903
I	Centramax	17164	2188	24	268	14684	62	44 (71%)	10674
J++	Centramax	13445	254	66	0	13125	79	42 (53%)	7086
K	TAS	16736	282	2	8	16444	86	33 (38%)	8006
L	TAS	5740	866	6	91	4777	25	21 (84%)	4419
M	TAS	Data could not be accessed							
N	TAS	6192	1404	22	0	4765	24	24 (100%)	4697
O	TAS	6581	295	0	1	6284	36	20 (56%)	4177
P	TAS	16382	3136	1	899	12346	57	32 (56%)	6989
Q	TAS	17946	3478	0	41	14427	56	43 (77%)	11255
Total						143061	636	401 (63%)	81232

+ length of clinical experience not supplied

++ age and gender of caller rather than patient provided. Correct data could not be supplied due to changeover of software in that site

3.3 The effect of case-mix

The three case-mix variables age of patient, gender of patient, and time of call were associated with the disposition (Table 3.3). Adults were more likely to be disposed to an urgent service than children (40% v 35%), particularly 999 and GP immediately. Females were more likely to be disposed to a moderate urgency service than males (24% v 21%). Calls made out of hours were more likely to be disposed to an urgent care service than calls made in hours (43% v 32%). Of the three case-mix variables, gender had the smallest effect, and for some of the subsequent analyses has been left out of the case-mix adjustment to reduce computation time.

Table 3.3 Percentage of calls in each disposition by case-mix variables

	Age of patient ^a		Gender of patient ^b		Time of call ^c	
	Adult	Child	Male	Female	In-hours	Out-of-hours
<u>Disposition</u>						
999	2	<1	2	2	1	2
A&E	9	9	10	9	8	9
GP immed	29	25	27	27	23	31
GP later	22	14	18	20	24	17
Self care	33	49	40	39	40	37
Other	5	2	3	4	4	3
<u>Triage urgency</u>						
High	40	35	39	37	32	43
Moderate	27	17	21	24	28	20
Low	33	49	40	39	40	37
TOTAL	44832	27422	30638	42863	23810	57421

age and gender of patient could not be obtained from one site

^achi-squared=2338, df=5, p<0.001

^bchi-squared=149, df=5, p<0.001

^cchi-squared=1056, df=5, p<0.001

3.4 The effect of software on disposition

There was an association between nurses using different types of software and disposition (Table 3.4). Nurses using Access were more likely to dispose calls to GP immediately, nurses using Centramax to dispose calls to GP routinely, and nurses using TAS to dispose calls to self care. In addition, nurses using Access were less likely to dispose calls to A&E.

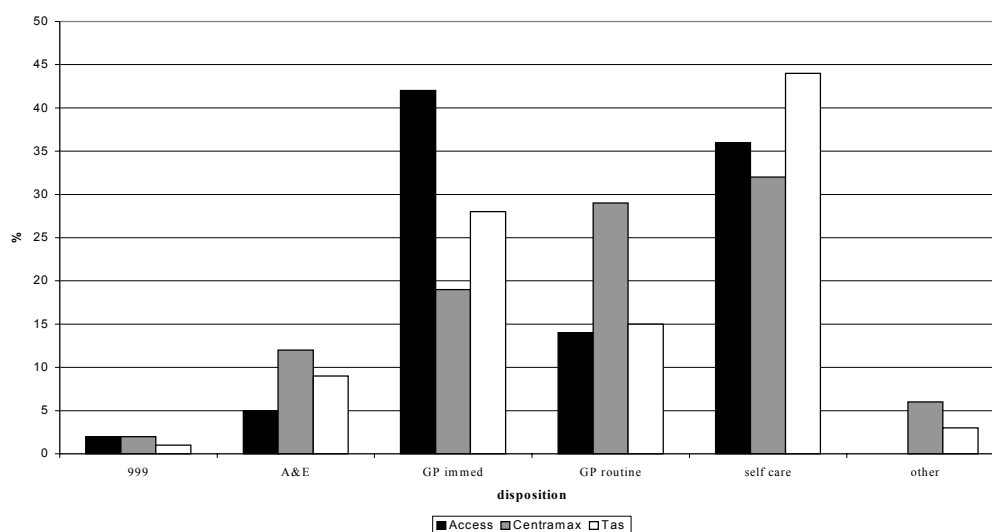
Table 3.4 Percentage of calls in each disposition by software, unadjusted for case-mix

Software	Access %	Centramax %	TAS %
<u>Disposition</u>			
999	2	3	2
A&E	5	11	9
GP immed	43	25	27
GP routine	14	26	15
Self care	36	30	44
Other	<1	5	3
<u>Triage urgency</u>			
High	50	39	38
Moderate	14	31	18
Low	36	30	44
TOTAL	11066	30623	39543

chi-squared=3869, df=10, p<0.001

The association between software and disposition remained statistically significant when log-linear modelling was used to adjust for differences in case-mix. The contribution of software to explaining differences in disposition was significantly larger than that of site, with case-mix adjustment for age and time of call ($F_{10,45}=6.01$, $p<0.001$). Gender was not included in the case-mix adjustment to reduce computation time. Differences between software, adjusted for case-mix, are displayed in Figure 3.1. Multinomial regression, based on the 3-category triage variable and adjusted for case-mix, supported this finding ($F_{4,580}=49.27$, $p<0.001$). This latter model took into consideration the large amount of variation between individual nurses. The conclusion is that there is strong evidence of an association between software and disposition.

Figure 3.1 Disposition by software, adjusted for case-mix



$F_{10,70}=63.6$, $p<0.001$

3.4.1 The relationship between software and site

The relationship between software and disposition was not wholly consistent within sites. All three Access sites disposed the lowest proportion of calls to A&E, two of the three Access sites disposed the highest proportion of calls to GP immediately, three of the four Centramax sites disposed the highest proportion of calls to GP routinely and five of the six TAS sites disposed the highest proportion of calls to self care. Two sites did not have the patterns of disposition associated with their software.

3.4.2 Potential confounding factors

Currently, many NHS Direct sites triage calls on behalf of GP out of hours services. It is possible that sites which triage on behalf of GP out of hours services have different patterns of disposition from those which do not. They might, for example, dispose a higher proportion of calls to GP immediately since this is the service sought by callers to GP out of hours services. Few sites triaged calls on behalf of GP out of hours services in April 2000 when we collected our data, and we adjusted our analysis for time of call which is associated with GP out of hours. Nonetheless, we explored further the effect of GP out of hours services on our results. The results show that sites which triaged calls for GP out of hours services disposed a higher proportion of calls to GP immediately, but that this effect was most noticeable within software (Table 3.5). Therefore this does not account for the large differences between software.

Table 3.5 Percentage of calls disposed to GP immediately and percentage of calls triaged for GP out of hours services by site and software

	Access			Centramax				TAS					
	1	2	3	1	2	3	4	1	2	3	4	5	6
% triaged calls triaged for GP out of hours services	0	0	3	28	7	0	0	38	60	0	0	0	0
% calls disposed to GP immediately	53	48	36	46	24	19	16	34	31	26	26	25	19

A further potential explanation for the large differences between software is that dispositions may be recorded in different ways by the different software, even though the same disposition is given to the caller. For example, some software may record calls as ‘information’, (excluded from our dataset), which other software would record as ‘self care’, (included in our dataset). This does not account for the differences between software because a study undertaken in the three first wave sites, where the same 119 low priority ambulance service calls were presented to one nurse in each site, who disposed calls to the same six options, revealed similar results to those found in our study.¹ The same patterns were present, with nurses using Access more likely to dispose calls to GP immediately and less likely to advise A&E than nurses using the other two software, and nurses using TAS more likely to dispose calls to self care (Table 3.6). The only difference between our results and those reported in the earlier study is that nurses using Centramax were no more likely to dispose calls to GP routinely than the other software.

Table 3.6 NHS Direct advice on low priority ambulance service calls¹

Advice	Access %	Centramax %	TAS %
999	27	31	24
A&E	23	44	44
GP immediately	24	6	3
GP routine	10	8	9
Self care	16	10	20
Other	0	1	0
All calls assessed (n=119)	100	100	100

3.5 The effect of length of clinical experience on disposition

Information about the length of clinical experience of nurses was available for 74604 calls. There was a small association between length of clinical experience and disposition (Table 3.7). Nurses with more experience were more likely to dispose calls to self-care: nurses with less than ten years experience disposed 34% of calls to self care and nurses with 20 or more years experience disposed 40% of calls to self care.

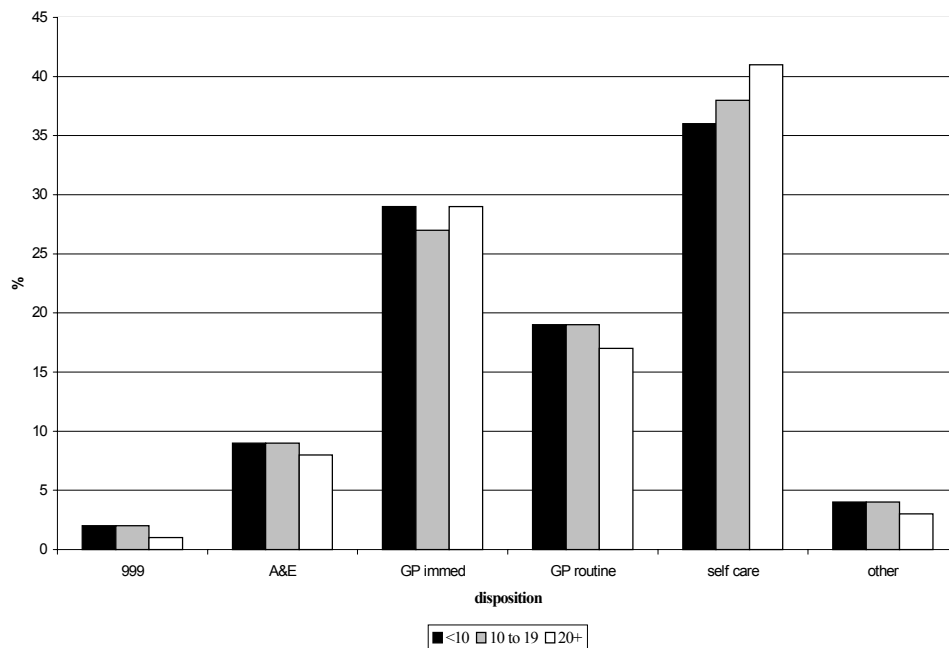
The relationship between disposition and length of clinical experience remained statistically significant when log linear modelling was used to adjust for case-mix and to test for the association within site. The computation time for running the model with the 6-category disposition was extremely lengthy and therefore we did not adjust for gender of patient. For the 3-category triage urgency we were able to adjust for all three case-mix variables within site and the relationship between length of clinical experience and triage category was statistically significant. Differences between lengths of clinical experience, adjusted for case-mix, are displayed in Figure 3.2. Multinomial regression, based on the 3-category triage variable and adjusted for case-mix, offered some support for this finding ($F_{4,580} = 2.1$, $0.05 < p < 0.1$). This latter model took into consideration the large amount of variation between individual nurses. The conclusion is that there is evidence of a small association between length of clinical experience and disposition.

Table 3.7 Percentage of calls in each disposition by length of clinical experience, unadjusted for case-mix

Length of clinical experience, in years	<10 %	10-19 %	20+ %
<u>Disposition</u>			
999	3	2	2
A&E	9	9	8
GP immed	31	29	30
GP later	19	19	17
Self care	34	36	40
Other	4	4	3
<u>Triage urgency</u>			
High	43	41	40
Moderate	23	23	20
Low	34	36	40
TOTAL	11370	30449	32785

chi-squared= 254, df=10, p<0.000

Figure 3.2 Disposition by length of clinical experience, adjusted for case-mix



F_{107,334}=5.48, p<0.001

3.5.1 The interaction between length of clinical experience and software

The relationship between length of clinical experience and disposition differed between the three types of software (Table 3.8). These differences were statistically significant when adjusted for case-mix using log linear modelling ($F_{20,280}=2.28, p<0.025$). The anticipated relationship between software and length of clinical experience was that the most prescriptive software (Access) would show little variation between nurses with different lengths of clinical experience and that the least prescriptive (TAS) would show much variation. This relationship was apparent but not particularly strong. There seemed to be least variation for Access, but Centramax, the software supposedly between the two extremes, showed the largest amount of variation. However, this relationship was not statistically significant when tested using multinomial regression. This latter model took into consideration the large amount of variation between individual nurses. The conclusion is that there is only weak evidence of an interaction between software and length of clinical experience.

Table 3.8 Interaction between length of clinical experience and software, unadjusted for case-mix

Software	Disposition	Length of clinical experience, in years		
		<10 %	10-19 %	20+ %
Access	999	2	2	2
	A&E	4	5	5
	GP immed	45	46	40
	GP later	14	13	14
	Self care	35	33	38
	Other	<1	<1	<1
	TOTAL	1920	3724	5422
Centramax	999	4	3	2
	A&E	11	10	11
	GP immed	31	28	27
	GP later	25	25	23
	Self care	21	28	31
	Other	7	6	6
	TOTAL	3295	10498	10927
TAS	999	2	2	1
	A&E	10	9	8
	GP immed	27	26	29
	GP later	17	17	13
	Self care	40	42	47
	Other	4	4	3
	TOTAL	6155	16227	16436

chi-squared= 124, df= 20, p<0.001

3.6 The effect of type of clinical experience

Information about the type of immediately past clinical experience of nurses was available for 77761 calls. There was a small association between type of clinical experience and disposition (Table 3.9). Nurses with a hospital background were less likely to dispose calls to self care than nurses with a community background. Nurses with a hospital background disposed 36% of calls to self care compared with community nurses who disposed 41% of calls.

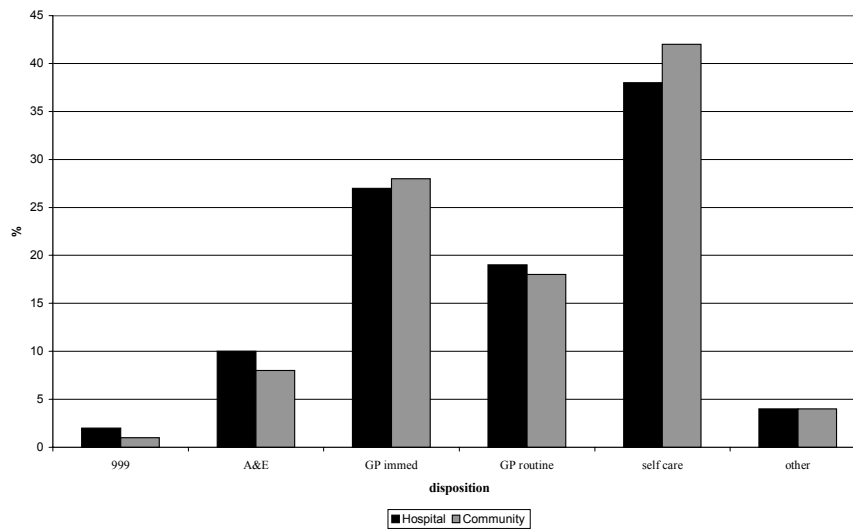
Table 3.9 Percentage of calls in each disposition by type of clinical experience, unadjusted for case-mix

Type of clinical experience	Hospital %	Community %
<u>Disposition</u>		
999	2	1
A&E	10	8
GP immed	29	28
GP later	19	18
Self care	36	41
Other	3	4
<u>Triage urgency</u>		
High	41	38
Moderate	23	21
Low	36	41
TOTAL	54177	23584

chi-squared=218, df=5, p<0.000

Log linear modelling was used to adjust for case-mix and test for the association between disposition and type of clinical experience within site. Again, the computation time for running the model with the 6-category disposition was extremely lengthy and therefore we did not adjust for gender of patient. For the 3-category triage urgency we were able to adjust for all three case-mix variables within site and the relationship between type of clinical experience and triage category remained statistically significant. Differences between types of clinical experience, adjusted for case-mix, are displayed in Figure 3.3. However, multinomial regression, based on the 3-category triage variable and adjusted for case-mix, did not support this finding ($F_{2,582} = 1.9, p > 0.1$). This latter model took into consideration the large amount of variation between individual nurses. The conclusion is that there is only weak evidence of a small association between type of clinical experience and disposition.

Figure 3.3 Disposition by type of clinical experience, adjusted for case-mix



$F_{60,180}=4.03, p<0.001$

3.6.1 The relationship between type of experience and software

Does the relationship between the background of the nurse and the pattern of disposition vary with the software in use? For Access, nurses with community experience were less likely to dispose calls to GP immediately and more likely to dispose calls to self care than hospital nurses (Table 3.10). This was also the case for Centramax, although the relationship was much stronger. For TAS, there appeared to be a slightly different pattern, with disposal more likely to the setting in which the nurses had most recently worked. That is, hospital nurses disposed calls to A&E and community nurses to the GP immediately. There was evidence that these differences were statistically significant when adjusted for case-mix using log linear modelling ($F_{10,175}=2.45, 0.05<p<0.1$). However, this relationship did not remain statistically significant when tested using multinomial regression. Therefore the conclusion is that there is only weak evidence of an interaction between software and type of clinical experience.

Table 3.10 Interaction between type of nurse and software, unadjusted for case-mix

Software	Disposition	Background of nurse	
		Hospital %	Community %
Access	999	2	2
	A&E	5	6
	GP immed	43	40
	GP later	14	14
	Self care	36	38
	Other	<1	<1
	TOTAL	7322	2814
Centramax	999	3	2
	A&E	11	11
	GP immed	28	21
	GP later	25	27
	Self care	28	34
	Other	5	6
	TOTAL	20265	7817
TAS	999	2	1
	A&E	10	7
	GP immed	26	30
	GP later	16	13
	Self care	43	46
	Other	3	3
	TOTAL	26590	12953

3.7 Specific type of experience

We collected details about the clinical specialty of the nurse, based on their most immediate past experience. Nurses from different specialties had different patterns of disposition (Table 3.11). A relationship between specialty and disposition remained when adjusted for case-mix within site (chi-squared=1720, df=239, $p<0.000$). However, there was only weak evidence of this relationship when tested against the large variation between individual nurses using multinomial regression ($F_{18,566} = 1.6$, $0.05 < p < 0.1$).

Interestingly, A&E nurses and practice nurses had very similar patterns of disposal. Intensive care nurses had the most unusual pattern of disposals, disposing 53% of calls to urgent services compared, for example, to A&E nurses who gave this advice to only 39% of calls. However, there were only 15 intensive care nurses in the study, distributed across six of the sites, and particularly in the three sites with the highest disposals to urgent services. Thus, the

apparently high disposal to urgent care by intensive care nurses was due to the fact that they tended to work in sites with a high proportion of disposals to urgent care.

Table 3.11 Percentage of calls in each disposition by detailed type of clinical experience, unadjusted for case-mix

	Detailed type of clinical experience									
	A&E %	Intensive care %	Hospital %	Paediatric %	Midwife %	General practice %	Health Visitor Nurse %	District Nurse %	School Nurse %	Commun- ity Nurse %
<u>Disposition</u>										
999	2	4	2	3	1	2	1	1	1	2
A&E	9	12	10	10	7	8	7	8	6	10
GP immed	28	37	30	32	22	29	27	24	35	29
GP later	19	16	19	16	19	20	17	19	16	17
Self care	38	29	35	38	49	38	45	45	36	38
Other	4	2	4	1	2	3	4	2	6	4
<u>Triage</u>										
High	39	53	42	45	30	39	35	33	42	41
Moderate	23	18	23	17	21	23	20	21	22	22
Low	38	29	35	38	49	38	45	45	36	36
TOTAL	19125	3156	25815	3725	3461	6647	3861	3040	2796	5529
No of nurses	76	15	103	18	13	34	20	18	15	23

chi-squared=805, df=20, p<0.001

3.8 Variety of experience

The pattern of disposition did not appear to vary by number of different specialties which nurses had worked in, even though there was a statistically significant relationship (Table 3.12). However, this relationship was not statistically significant when adjusted for case-mix and tested against the variation in individual nurses using multinomial regression.

Table 3.12 Percentage of calls in each disposition by variety of clinical experience, unadjusted for case-mix

Variety of clinical experience	<4 specialties %	4+ specialties %
<u>Disposition</u>		
999	2	2
A&E	9	9
GP immed	30	30
GP later	18	17
Self care	37	38
Other	4	4
<u>Triage</u>		
High	41	40
Moderate	22	22
Low	37	38
TOTAL	41019	32929

chi-squared=29, df=5, p<0.001

3.9 Length of experience in NHS Direct

The pattern of disposition did not appear to vary by length of experience in NHS Direct, even though there was a statistically significant relationship (Table 3.13). However, this relationship was not statistically significant when adjusted for case-mix and tested against the variation in individual nurses using multinomial regression.

Table 3.13 Percentage of calls in each disposition by length of NHS Direct experience, unadjusted for case-mix

Length of time in NHS Direct	< 7 months %	7+ months %
<u>Disposition</u>		
999	2	2
A&E	9	9
GP immed	28	29
GP later	19	19
Self care	38	37
Other	3	4
<u>Triage</u>		
High	40	40
Moderate	22	23
Low	38	37
TOTAL	28839	51522

chi-squared=103, df=5, p<0.001

3.10 Gender of nurse, as a proxy for confidence

Male and female nurses had different patterns of call disposal (Table 3.14). Male nurses disposed 42% of calls and female nurses 37% of calls to self care. This supports the hypothesis generated in the qualitative study (see Chapter 4), that male nurses appeared to be more confident than female nurses and that confidence would lead nurses to dispose more calls to self care. However, this relationship did not reach statistical significance when adjusted for case-mix and tested against the variation in individual nurses using multinomial regression.

Table 3.14 Percentage of calls in each disposition by gender of nurse, unadjusted for case-mix

Gender of nurse	Male %	Female %
<u>Disposition</u>		
999	2	2
A&E	8	9
GP immed	28	29
GP later	18	19
Self care	42	37
Other	3	4
<u>Triage</u>		
High	38	40
Moderate	21	23
Low	42	37
TOTAL	10298	70204

chi-squared=119, df=5, p<0.001

3.11 Nurse overriding of software recommendations

Access software records both the recommendation of the software and the recommendation made by the nurse, allowing us to study explicit over-riding of software recommendations by the nurse. In addition, we can study separately upgrading and downgrading of software recommendations by nurses. We had usable data from three Access sites, where 11% (1182/11066) of calls were classified by the software as over-ridden. This varied between 9% and 13% for the sites (chi-squared=37, df=2, p<0.001). When we categorised the calls into a smaller number of groups which were similar to those used in our study, that is '999', 'urgent', 'see provider', 'make an appointment' and 'self care', the proportion of over-rides was 6% (599/10578), with 3% upgrades and 3% downgrades. There was evidence to support some of the findings from the qualitative study and the full dataset, in that nurses with less than 10 years experience were more likely to upgrade calls than downgrade them for example (Table 3.15). However, perhaps the most noteworthy issue is that any differences between types of nurses were very small.

Table 3.15 Proportion of upgrades and downgrades by different variables

	%Upgrade	%Same	%Downgrade	Total
Age of patient*				
Adult	3	94	3	6337
Child	3	95	2	4007
Gender of patient				
Male	3	94	3	4342
Female	3	94	3	5706
Time of call				
In-hours	3	94	3	3578
Out-of-hours	3	94	3	9918
Length of experience+				
<10 years	4	94	3	1839
10-19	3	94	3	3512
20+	2	95	3	5227
Type of experience				
Hospital	3	95	3	6953
Community	3	94	3	2719
Variety of experience *				
<=3 specialties	3	95	2	4587
4+	2	94	3	5875
NHS Direct experience*				
<=6 months	3	95	2	2804
7+	3	94	3	7288
Gender of nurse				
Male	3	93	4	2334
Female	3	95	3	7973

*p<0.05, +linear trend p<0.05

4. Results: Nurses' perceptions of clinical decision-making in NHS Direct

Forty-eight nurses were asked to participate in the study, 43 agreed to participate and the planned 24 nurses were interviewed. We feel that we obtained a sample which would allow us to explore similarities and differences in nurses' perceptions by software, length and type of clinical experience, length of experience in NHS Direct and possibly gender. As planned, there were eight nurses from each of the three software, two nurses from each of the 12 sites, and approximately half of the nurses had a hospital background. The nurses had backgrounds mainly in A&E, hospital wards, health visiting and district nursing. We did not sample, as planned, on length of clinical experience. However, we obtained a good mixture of length of experience, varying between 4 and 30 years, with two thirds of nurses having 10 or more years of experience. This over-represented nurses with shorter lengths of experience who make up only 16% of the nursing workforce of NHS Direct.⁷ Length of experience in NHS Direct varied between 4 and 24 months, with two thirds working there for a year or more. Only a small proportion of NHS Direct nurses are male; we interviewed six male nurses, which was enough to explore tentatively the effect of gender. About half of the nurses did not have managerial roles or a particular interest in research. Although not recorded formally, we interviewed nurses who worked part-time, full-time, and with different shift patterns.

The first issue we explore below is nurses' perceptions of the relationship between the software and the nurse. After all, if they feel that the software is the key influence on the recommendation given to NHS Direct callers, then this has consequences for the influence of the nurse and the importance of skill mix. Then we move on to explore nurses' perceptions of the influences on clinical decision-making, focusing first on the issues of length and type of clinical experience with which we had an *a priori* interest, and then on to other influences which nurses identified during the interviews or which emerged from the analysis. Finally we explore whether nurses themselves felt that they give different advice from their colleagues.

4.1 The relationship between the software and the nurse

a. The software – essential but not sufficient

The majority of nurses considered the software to be **essential** to clinical decision-making, with only one nurse feeling confident in their ability to work without it.

I think it's imperative that we have software. (Nurse 19)

But I feel a good experienced all round nurse will be able to assess the patients without an algo. I really do. [...] You see I'm feeling quite confident assessing without it. (Nurse 5)

They felt that it was essential because it acted as a **safety net** to ensure that they had thought of all potential conditions, and recommended the safest, most appropriate outcome. Some nurses felt that it helped to provide **consistency** of advice across different nurses.

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. (Nurse 9)

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. (Nurse 15)

In addition, the rationale of the software and the extensiveness of the guidelines made the software a good **learning tool**. Nurses felt that by following the rationale behind the guidelines, they picked up knowledge as they worked.

... it's a huge educational process, not only for the nurse, because you are picking up on self-care information all the time yourself plus the rationale of the questioning.... (Nurse 18)

More than half the nurses we interviewed felt that the software was not sufficient because it **could not be used for all conditions** - some conditions were not covered by guidelines or the relevant guideline could not be located. Nurses using Centramax and TAS in particular commented upon gaps in the software, while nurses using Access were more likely to comment on how extensive they found the software.

...like someone phones up, they've had a problem for a week or two, it comes up as A&E immediately or 999 and they've coped with it for a week already. (Nurse 7)

There are areas that aren't covered by the system and you have to depend on your own experience. If it covers it, it's OK. (Nurse 2)

A few nurses commented on the **individuality of the patient** and the inevitable shortfalls of a standardised piece of software in being able to classify a person's symptoms completely. For example, some guidelines did not take account of factors such as past medical histories.

...as I said, patients are all individuals and they will say something that doesn't fit in with the software, and then [...] it's only...it's a standard, it's a set of standards, it doesn't take into account individuals. (Nurse 12)

Interviewer: *But yet it doesn't totally dictate the way you work?*

Nurse: *Oh no, I would find that difficult, because it's as I keep saying... you can not 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". (Nurse 17)*

The nurses seemed both pleased and relieved to have a computerised decision support software available to them to ensure that they offered a safe service to callers. However, they identified two limitations of any software: a) that it did not cover all health problems, an issue that is by no means unique to NHS Direct since other triage services have found that 20% of episodes could not be triaged by computer¹¹ or have had problems with finding the protocol to enter to best fit the situation of the caller.¹² b) that each patient has unique circumstances which may not fit the standardised protocols available. Thus the nurse appeared to take the role of 'mopping up' any calls which the software could not handle.

b. The nurse as active inquirer

Many of the 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 more on asking questions and their listening skills to develop a picture or **visualise the patient** and their problem.

....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. (Nurse 18)

They 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. As well as listening carefully during a call, they talked about having to ask the right questions and **probe the patient to 'find the truth'** because different callers could give different interpretations of pain levels and symptoms, with some patients appearing to exaggerate symptoms and others underplay them.

...the typical one is that someone phones up and says they're really breathless but they're holding a perfectly normal conversation with you, or they've got, they are in agonising pain, abdominal pain and yet they're talking. Or they phone up and they say I've got a persistent cough that won't go away and they're on the phone for 20 minutes and they haven't coughed once. You know this is all very significant stuff in your clinical decision-making. You know so it's about listening to kind of verbal cues as well. (Nurse 15)

... 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'. (Nurse 10)

The nurses felt that it was important to think about and assess the caller's problem independently of the software as well as with the software. Three nurses used the metaphor of a monkey and another of a robot to explain that unless a nurse used critical thinking and drew upon their clinical experience then one **might as well have monkeys on computers**. One nurse made the point that these skills could not always be used during busy periods, when the whole NHS Direct process felt like a production line.

I think first of all they've got to agree, and 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. Because if you're just churning out end point after end point there's no point in having anybody who can actually think about it. (Nurse 18)

.... such as over the Christmas period ...and the amount of calls is just phenomenal, absolutely phenomenal, and you go through the calls, calls,

calls. 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. But then again you've got the safety net of the software, but it does get really one caller after another. It's just so bad, you know I've not come across that, 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..."(Nurse 11)

The nurses felt that they took an active role during the triage process. Their descriptions of the process of decision-making were similar to descriptions of nurse triage without software. Visualisation or building a picture has been identified as a major component of the reasoning strategy utilised by nurses when making triage decisions by telephone in minor injury units, where nurses compensated for the absence of face-to-face contact by creating a mental image of the pathology, the person and the situation being dealt with.¹³ In addition, the role of the triage nurse as inquirer, with an iterative process occurring between the caller and the nurse to elicit information, interpret it and negotiate meanings is well recognised in nurse triage.¹⁴ Thus, as well as 'mopping up' calls which the software could not handle, the nurse appeared to take the role of active inquirer to ensure that the sensible answers were entered into the software.

c. The software as a support to the nurse

The majority of the nurses talked about how the nurse and software need and complement each other; that the software plays a vital part in the decision-making process, but works only in combination with the nurse.

What contributes to that [the decision] is my own knowledge, it's greatly my own knowledge, my own experience, my experience as a parent, a human being, a nurse, general public, plus what the guidelines are telling you. (Nurse 20)

In terms of the balance between the nurse and the software during the clinical decision-making process, that is, whether the nurse assists the software or the software assists the nurse, there was a general feeling that **the software supported the nurse**. Most nurses felt that they were making the decisions, backed up by the software. Nurses found it difficult to describe the balance between the nurse and the software in percentage terms. The nurse below volunteered a percentage although this is likely to vary by nurse. However, a minority of nurses, such as nurse 16 below, felt that they followed the software, only giving additional health advice to the software recommendation. Surprisingly, there was no evidence that the role of the nurse differed by the type of software used.

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. (Nurse 21)

So I would say, well, I'll put a percentage on it, say seventy percent software, and thirty percent intuition, knowledge, nursing experience, life skills, communication etc, would be compatible as far as I could see because you'd be acknowledging the software. (Nurse 11)

Well the software tells you really what's what, suggests what you should be looking forSo you've got to be guided by it. I mean if it says A&E, that's what you've got to recommend.(Nurse 16)

Many nurses said they relied on the software more for areas where they have **less clinical expertise** and some nurses felt the software **limited their ability to use their clinical knowledge**, particularly in areas where they had more clinical expertise. There was no obvious difference between nurses' reactions to the flexibility of different software, although the ability to override software recommendations was seen as giving the nurses further flexibility.

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. (Nurse 14)

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 within that. (Nurse 15)

But the good thing about it is that you can use your nursing knowledge and judgement to actually change the end point as necessary. (Nurse 9)

The level of **agreement between nurse and software** was generally high, a point made particularly by Access nurses. When nurse and software did not agree, nurses had the ability to upgrade or downgrade the software recommendations, because there were other factors the software had not taken into account.

...it's not very often that you want to change the end point really. Most of the time I think it's spot on. (Nurse 22)

...I mean, you know usually it comes to the same decision as what I was planning (Nurse 5)

The nurses described a partnership between the software and the nurse, where each partner's strengths compensated for the other's weaknesses (Figure 4.1). For some nurses, the software held full authority. However, the majority of nurses perceived themselves as using the software to support their decisions. That is, as well as mopping up issues the software could not handle and actively inquiring into the health problem to ensure that sensible information were entered into the computer, they applied critical thinking skills to make their own assessment of the health problem. This suggests that the nurse has considerable influence on the decisions made. However, the nurses also noted that the level of agreement between nurse and software was generally high, possibly suggesting consistency between nurses.

Nurses made few comments about the differences between the software because they had only experienced one type of software. Surprisingly, there were few differences in the types of comments they made about decision-making in conjunction with the software. There was no evidence that nurses using Access (most prescriptive) felt more restricted by the software than those using TAS (least prescriptive) because nurses using Access could over-ride recommendations if required.

Figure 4.1 Nurse-software partnership, based on nurses' views

SFTWARE	NURSE
Strengths Consistency Knowledge Safety	Weaknesses Knowledge gaps
Weaknesses Gaps Individuality of patient	Strengths Clinical experience Critical thinking

4.2 Influences on clinical decision-making

a. Clinical background

Nurses felt that the specialties they had practised influenced their work in NHS Direct, although not necessarily the recommendation they gave to callers. They felt that their clinical background affected their approach to the call, enabled them to provide the caller with more in-depth information than the software could provide, allowed them to provide practical advice about the service they were recommending the caller to visit, and allowed them to give speedier advice if they had knowledge of the caller's problem. Nurses with a community background felt that they had a better understanding of patients' social circumstances than hospital nurses.

I think working in the community you are used to working on your own and actually giving people advice, which does help.[...] But I think working in the community you have also got more idea of what people are doing and what they are putting up with in their own homes and how much they can cope on their own.
 (Nurse 22)

Some nurses felt that their background affected the recommendations they gave although there was no consistency regarding the direction of that influence. For example, nurses with a hospital background might either take calls more seriously because their experience was that a high proportion of patients have serious conditions, or might feel that someone needed to be in a critical condition before they should seek care. Additionally, nurses with experience in the caller's problem might either be more likely to change the software recommendation to a higher one because they had had experience of something going wrong in the past, or might change the recommendation to a lower one because they had confidence in their own knowledge. One nurse with experience in A&E talked about seeing the serious side of things compared to a primary care nurse (see below), yet treating some health problems less seriously than another nurse who did not have such extensive experience in that clinical area.

...one of the nurses who's come from the primary care background, we look at the calls, and I automatically see the A&E side of it, where you should see the primary care side of it. So prior to taking the call, just looking at the message we'd already be on two separate tracks. I've gone for the bad side of it and she's gone for the 'I need to see a GP' side of it, 'go home - have a couple of paracetamols' side of it, and its only then you've then got to sort of be objective and look at it and think actually no its not an A&E thing, its not quite that bad. Sometimes you're automatically picking on oh its chest pain, go off to A&E rather than....you've actually got to sort of step back and think oh hang on a minute, talk this through. (Nurse 7)

I'm sure [practice nurses] have a very general knowledge, but I don't think they have the urgency about them in their assessments. And again I have to bring up, because it's, I've actually seen a patient come in with chest pain, with back pain that was rushed to theatre within 10 minutes, because it was a leaking aneurysm. (Nurse 19)

I try to avoid sending people to A&E unless its really, really necessary. I try to avoid that, because I know coming from A&E, I know the pressures of that. If I deem it's necessary to go to A&E, then I....I'm considering it as an emergency situation. And if that's the case then I would probably call 999 and order an ambulance for them. (Nurse 20)

Interviewer: *So it (clinical background) has an effect in terms of how you give the advice, rather than what the actual advice is?*

Nurse: *Yes, yes [...] I mean the advice is the same, it's probably, I don't know, the extra bits you can give (Nurse 22)*

There was some evidence that hospital nurses and community nurses approached calls in different ways. However, the direction of any effect on the disposition was not clear, with evidence of hospital nurses treating calls either more seriously or less seriously because of their background. An interesting theme was the importance of the nurse having clinical experience specific to the patient's health problem. It seems that the nurse might be more likely to override the software recommendation, in either direction, if they have detailed knowledge of a health problem, and may feel somewhat restricted by the software in these circumstances.

b. Length of clinical experience

Length of clinical experience was one of the main influences under study, and has been identified as affecting clinical decision-making in a telephone advice setting.⁶ Yet the nurses did not have very much to say about it. When nurses did feel that it influenced their decision-making, they thought it was important to have some years of clinical experience behind them and some nurses felt that they could not have worked in NHS Direct with less experience. However, two nurses with less than ten years clinical experience disagreed, making the point that they felt comfortable with the decisions they made. Two nurses with many years of experience felt that more newly qualified nurses were more up-to-date than those with longer experience. Thus there were mixed feelings about the importance of length of clinical experience for working in NHS Direct.

I would have said ideally about ten years experience practising [...] I do think, you know, they've got to have qualified and got a good few years under their belt. (Nurse 8)

A lot of my colleagues have had years of experience -some of them 20 years. Some, to be fair, have worked in one area for 20 years, such as accident and emergency. And I think, I think to be honest everybody feels restricted in some way, and they are very comfortable with their own area, their own expertise. I think if you compare yourself with people that have been qualified a long time you sometimes feel, you could feel inadequate, but then again you have got to feel comfortable with your, you know your experience really, your practice. And I do feel comfortable with that..... but I feel that

the whole - all your life skills together, plus your knowledge, plus your qualification - I think that's what eventually makes you feel it works. (Nurse 6)

I don't know because the girls that haven't been qualified as long as I have you know you could argue that they, their experience is much more up to date. (Nurse 4)

There was a general sense that nurses needed a number of years of experience behind them to work in NHS Direct but no sense that 20 years put them in a better position than 10 years experience; in fact being up-to-date then became an issue. Nurses with only a few years experience were keen to stress that this was not a problem since they worked within their comfort levels. Of course the comfort levels of a nurse with 20 years experience might be very different from the comfort levels of a nurse with 8 years experience, particularly when considering whether to downgrade calls.

c. Variety of clinical experience

We did not consider the influence of variety of clinical background in our interview schedule. Yet half of the nurses mentioned the importance of **an individual nurse having a varied clinical background**, spanning both hospital and community experience. The rationale behind this was that NHS Direct covers a wide range of types of calls and problems and a nurse with a wide knowledge base would be better equipped to deal with this.

...certainly some acute work, and certainly for this place, especially now, a knowledge of community issues. (Nurse 24)

Because I think you need more than two disciplines really, in your background, because there's absolutely anything and everything that comes through the system. So the more information, the more knowledge base that you've got yourself, then you know, the better you are ...That's when you tend to focus an awful lot more on the software with a clinical area where your knowledge is limited. I think that's what the problem would be if you'd got a limited nursing background because that means that you could be relying on the system so much more heavily. And, but then, you can't know everything about everything. But the areas you do lack in you do tend to focus an awful lot more on the system, looking through every 'unsure' button. (Nurse 9)

However, it was not just the variety of individual experience that was considered to be important, but also **the variety of experience in each site** because, as we discuss in the next section, nurses rely on colleagues' knowledge as well as their own during the decision-making process.

I think the ideal nurse would be a specialist in everything to be honest, but I mean how many nurses are specialists in everything? So I can only say that I think the more knowledge you have, like I'm a community trained nurse as well, so I'm not just looking at the acute stage of a patient, ideally we should have every bit of knowledge and we haven't got it. So I think the ideal nurse in NHS Direct is a team where we have got everything across the board between us. So we can actually draw on our colleagues' knowledge and skill. (Nurse 19)

The partnership described between the software and the nurse implied that nurses might rely more on the software where they have gaps in knowledge. We could assume from this that nurses would be less likely to over-ride recommended dispositions if they had a narrow clinical background. This suggests a hypothesis that there will be differences in patterns of dispositions by variety of background. This variable is measurable and was collected from nurses during the quantitative study.

d. Experience in NHS Direct

Nurses felt that they changed as they accumulated experience in NHS Direct. At first they felt dependent on the software, they lacked confidence, were slower in giving advice, and had to get used to the software. As time went by, they felt that they got to know the software and the more commonly used algorithms and used the software as a learning tool to fill gaps in clinical knowledge. Some nurses felt that the information and self-care advice they gave, rather than the recommendations, were affected by these changes. However, some nurses felt that their experience in NHS Direct affected the recommendations they gave and other nurses made comments implying this. Approximately half of the nurses made comments about lacking confidence, dependence on the software, or use of higher endpoints when they first worked in NHS Direct.

It does influence us a lot, you know - when you first start, everything is by the book. (Nurse 16)

... using the guidelines, you would still come to the same recommendation as such, which would still be home care but perhaps we can give a little bit more knowledge on home care, we can give the parents a little bit more, you know, what to do and what to watch out for, and yes that would speed up the process if you knew what you were talking about. (Nurse 24)

And I think that when you embark on NHS Direct you are on a huge learning curve, for many reasons, because of the software, the telephone stuff. Butclinical decision-making is very much influenced by experience. You know when you first start you're very anxious that if you give self care to somebody that you haven't missed something. I'm much more comfortable with that, because I've had no repercussions, which is you know, nobody's come back to me and said, you know, you missed my lung cancer and told me to give me self care. (Nurse 15)

This implies that when nurses were new to NHS Direct, they either rigidly applied the software, or were more likely to upgrade than downgrade software recommendations. This suggests a hypothesis that there will be differences in patterns of dispositions by length of experience in NHS Direct. This variable is measurable and was collected from nurses during the quantitative study.

e. Life experience

Nurses talked about the influence of what they termed 'life experience' on their work. Their age and maturity, and the fact they had worked outside the health service, meant that they had 'seen a lot' and were more able to understand and communicate with callers. They felt that if

they had had children then this gave them empathy with some callers. The effect on recommendations given varied in that they might upgrade because they understood why the caller was anxious or they might keep a recommendation as self care even if the caller was anxious because they understood that the situation was worrying but not serious.

I think possibly it's because I think a lot of girls who haven't had children and looked after them at home. It's a completely different ball game to say looking after very poorly sick children in hospital. And the problem with children is even with a temperature they can appear to be really quite poorly, but in fact might just have a virus which is only going to last two or three days. But if you've actually worked through that yourself, you realisethat the mum is going to be extremely anxious but at the same time given a little bit of self care at home the child will probably be alright. So you can draw on your own experiences and I think it does affect the way you treat them,you're probably a little bit more sympathetic I think. (Nurse 23)

f. Colleagues

As stated above, nurses liked having a **varied team** around them. They were aware of their skills limitations and drew on colleagues' advice to fill their knowledge gaps. They felt that they learnt from their colleagues and could gain confidence from their colleagues' viewpoints when giving recommendations or advice. In a triage situation, some nurses used colleagues' advice to over-ride the recommended disposition or determine the right disposition, although two nurses emphasised that the decision was theirs to make and their colleagues' advice was part of an information gathering exercise rather than joint decision-making. In some sites nurses had to seek colleagues' advice prior to over-riding a software disposition.

But I mean we bounce off each other, we work hard and we work very well together as a team and we, we share experiences, we've got quite a good variety of experience between us, coronary care nurses, so we can tap into each other. (Nurse 21)

But sometimes the outcome isn't quite what you want it to be. And I think it's those occasions really when you use your expertise or other people's expertise. And you change that outcome. You are not allowed to change it down, reduce it, but you can increase the severity.... You see also in a call centre situation you hear other people giving advice and you pick up on some of the things that people are saying, and you learn a lot from that. (Nurse 1)

It is possible that support from colleagues might lead to more consistency in recommendations given. However, this assumes that all sites have a large number of nurses working in the same place at the same time, that there is a range of different types of nurses in each site, and that nurses have time to interact over calls. These conditions do not apply to all nurses in all sites at all times⁷ and would not apply in a 'teleworking' model of NHS Direct in which nurses work from home.

g. Patient/caller characteristics

The four patient characteristics most frequently mentioned by nurses as influences on their clinical decision-making were age of patient, anxiety level of caller, previous service use, and whether the patient would comply with the advice. **Age of patient** was mentioned in relation

to chest pains, where a more cautious approach would be taken with a middle-aged person than a young person. Additionally, some nurses felt that their decisions erred on the side of caution with children. If the **anxiety** level of a caller was high and could not be alleviated then the nurses would upgrade a recommendation. Nurses said that they overrode recommendations if the patient had **recently used a service** and it seemed inappropriate to follow the software recommendation and send the patient back there. In addition, **a patient's lack of compliance** with the recommendation or ability to comply with self care advice sometimes caused the nurse to over-ride the recommendation. Other characteristics were mentioned less frequently such as presence of co-morbidity, social circumstances (e.g. elderly living alone), length of time with symptoms, patient preference for a service, and expectation of patient.

....children are, they are a worry aren't they? I mean I had a lady yesterday – 'I have an emergency appointment at the GP surgery but the child's better'. I said 'no you can't play around with children can you?' (Nurse 10)

You get someone with a sore throat. A GP has seen them earlier on in the day and prescribed antibiotics, made a diagnosis. They phone up six hours later and say, 'Well I've still got a sore throat' and you listen to their symptoms and the system says that they should see the GP in 4 hours. Well this is clearly inappropriate. So you know you downgrade that to self care, with advice. If you couldn't do that, you'd be lost, wouldn't you? Utterly lost. NHS Direct would be lost. (Nurse 13)

I do think when people ring via the GP on call number that they want a doctor despite everything. So you could spend 15 minutes triaging, giving the advice that the doctor may give anyway. But they still want the doctor at the end of it. So that's the time when I would say at a guess, the majority of us would over-ride and say, despite disposition caller requests GP. (Nurse 6)

The lower risk threshold operated for children highlights the importance of our case-mix adjustment in our quantitative analysis. The importance of the other issues depends on the extent to which different types of nurses interpret these patient characteristics differently.

h. Availability of services

Nurses felt that the availability of services affected the recommendation they gave, in terms of the time of day (some services were less available out of hours than in hours), geography (a caller might live next door to A&E), and knowledge of local services (that a service is currently busy or that another local service can deal with it).

Well in the ideal world you should both come up with the same decisions, shouldn't you..... the software could be telling you that they should go to casualty immediately, and I can acknowledge that they need to see somebody, but you also know that if they went to casualty at midnight, the service isn't there anyway. So again you're having to over ride the system, because you're not triaging them as being seen immediately. And unfortunately the NHS, although it's available 24 hours a day, not everything is there 24 hours a day. (Nurse 4)

This shows the importance of time of day as a case-mix variable in our quantitative analysis.

i. Intuition

Some nurses said that they acted on ‘gut instinct’ or intuition either to upgrade or downgrade some recommended dispositions.

If we are upgrading, you know you might get a feeling that perhaps errrm... You are upgrading because of, I mean it could be a nose bleed, but you know they are taking aspirin or warfarin, so you know its because of your experience, and because of the way you've questioned them, that maybe you're sensing that there is something a bit more acute, than the actual software makes you realise (Nurse 24)

It has been suggested that normative decision-making is too simple to handle complex decisions with multiple contextual factors, and that there is room for intuitive judgement in clinical decision-making.¹⁵ This intuitive judgement has been defined as ‘understanding without a rationale’¹⁶ and is both devalued because someone can produce the wrong answer intuitively, and welcomed because it distinguishes expert human judgement from decisions made by computers or beginners. In our study, the issue of intuition tended to be brought up by more experienced nurses, and particularly when discussing the downgrading of calls, implying that it was being used as part of a nurse’s expertise.

j. Confidence

Dealing with uncertainty is an important issue in decision-making. Nurses did not explicitly mention uncertainty, but at some point in the interview the majority of nurses spontaneously mentioned confidence. This was mainly about gaining confidence from their experience in NHS Direct and having a sense that on first arriving in their new job they had lost confidence in their nursing skills and had to rediscover this confidence.

At first I felt like, you know I was just, the software was dictating the calls.I think after a while when you become more confident, it's dead bizarre because (and everyone seems to say the same), when they first come to the call centre it's as if their nursing knowledge, has vanished.So then it tends to be very algorithm, you just go with the algo As you become more confident, it's as if your nursing knowledge seems to come back again, and you start to think independently. Then you can rationalise more what the computer actually what the software's actually trying to identify. (Nurse 9)

A small number of nurses talked about their previous clinical experience giving them the confidence to work in NHS Direct, feeling confident in the software, and upgrading recommendations or relying more on colleagues or the software if they did not feel confident. Thus there was evidence that confidence was associated with the factors already discussed as influencing clinical decision-making such as length or type of clinical experience. However, there was also evidence that some nurses were much more confident personalities than other nurses, regardless of their background experience. This came across in the language they used to describe themselves and their behaviour. Two nurses from the same specialty, with the same length of clinical experience and the same length of experience in NHS Direct, used language such as “*always ridiculously over-confident*” (Nurse 13) and “*you always tend to run home to mother when you’ve got a problem*” (Nurse 4), giving the impression of a very confident personality and a very cautious personality. However, there was not enough information within the interviews to compare their risk-taking behaviours during triage because although the first nurse said “*I more often downgrade than I upgrade*”, they also said they would “*err on the side of caution*” in some circumstances; and the second nurse talked about incidents where they would downgrade. We felt that confidence was an important issue in clinical decision-making but that we did not have enough data to explore the complexities

of its impact on clinical decision-making. The implication seemed to be that a lack of confidence was associated with upgrading recommendations and confidence was associated with downgrading recommendations. Yet it was more complex than this because a highly confident nurse said that they recommended urgent care more frequently than their colleagues and were confident that they were right in doing so.

Prior to analysing the interviews in depth, we felt that male nurses seemed to exude more confidence than female nurses. When we undertook our detailed analysis, we did not have very much evidence to support this impression. However, prior to this in-depth analysis, we decided to collect the gender of the nurse as a proxy for confidence for our quantitative analysis and test the hypothesis that dispositions would differ by gender of nurse.

4.3 Do different nurses give different advice?

When asked explicitly whether they gave different recommendations from their colleagues, there was no consensus opinion from the nurses who were asked the question, with half saying they did and half that they did not. Those who felt that different nurses gave different recommendations felt that it could happen where there were gaps in the software or where nurses had clinical experience related to the caller's problem, leading either to the recommendation being upgraded or down graded. Nurses who felt that the advice was consistent between nurses felt that although they might give the advice in different ways or at different speeds, the software ensured that the recommendation was consistent. The nurses' views did not appear to differ by the software in use.

Yes, probably, yes. I think I do because I think we've all come from such different clinical backgrounds. And you know there's a plethora of knowledge out there, it's not universal. It's unique knowledge to unique nurses. Yes my background does influence my handling of the call. (Nurse 15)

No, I don't think so, I think because of the questions there, you might give more information home care wise, and you might be able to, you know perhaps if somebody was going to a GP and they had a few hours to wait, if you have more clinical knowledge than somebody else, you might give them better, immediate advice. You know, but not actually to change the disposition. (Nurse 24)

However, the nurses who felt that recommendations were consistent across nurses tended to think that this was true 'in general' and seemed to be implicitly saying that there was some scope for inconsistency.

And listening around the call centre I think, I think people are pretty much, people are generally consistent in what they do, you know, across this call centre. (Nurse 13)

No I don't think so. I think the only thing that I would do differently, your own speciality I think may be that's the only thing that I would do any different I think. (Nurse 8)

I would say probably eighty percent of the time, I can't, you know, it wouldn't, the outcome wouldn't alter that much (Nurse 11)

There were two ways for nurses to develop different recommendations from their colleagues. The first way was implicitly, in that nurses gleaned different information from callers and therefore answered the software questions differently. The second way was explicitly, with the nurse over-riding the recommendation given by the software – either upgrading to a higher endpoint or downgrading to a lower endpoint. All of the influences discussed above could act implicitly upon the nurse and the nurses discussed how they acted explicitly when they over-rode recommendations. Although everyone upgraded recommendations, two nurses said that they did not downgrade recommendations and **nurses from Centramax sites said it was site policy not to downgrade calls**, with nurses in one site allowed to do so only after discussion with colleagues. Discussion with colleagues was considered to be important when nurses were considering changing the recommendation. There was no apparent relationship between nurses' willingness to upgrade or downgrade and their clinical experience.

... I can't say I always downgrade or always upgrade. I would say it's six of one and half a dozen of the other. (Nurse 17)

Oh I'd, to be honest I don't upgrade a lot. I more often downgrade than I upgrade. Much more. (Nurse 13)

I'm possibly one of the more cautious staff, maybe, and maybe I will tend to triage up rather than down. (Nurse 21)

The nurses fell into two camps, either feeling that different nurses give different triage advice or that most of the time nurses give the same triage advice. Although these two groups sound as if they disagree, they may simply interpret the same information in different ways. Whatever the interpretation, the nurses felt that at times different nurses give different triage advice.

4.4 Other issues: call-choosing and the new NHS Direct software

Nurses made comments on some issues which are not directly relevant to our study, including how they felt about working in NHS Direct, their training needs and the qualities of the ideal NHS Direct nurse. These views are presented in Appendix C. Two issues of direct relevance to our study are presented below.

4.4.1 Call choosing

In our quantitative analysis we have assumed that nurses do not have a choice in the type of calls they take. Three nurses spontaneously mentioned choosing the type of call they answered. One nurse said that they could choose their calls when they first arrived at NHS Direct but that this had changed and they now had to take the next call at the top of the queue. Another said that they were asked to take the urgent calls because of the length of their experience in NHS Direct. Another avoided calls which they knew nothing about and directed them to colleagues with the relevant expertise. Thus call choosing occurs in NHS direct, but there was no sense from the interviews that it is a common occurrence.

4.4.2 The new software in NHS Direct

NHS Direct is in the process of introducing a common software across all sites, the NHS Clinical Assessment System (CAS) or Axa. Although only two of the nurses, both from the

same site, had actually used CAS, a few more of the nurses had heard about the new software and were optimistic about it, expecting it to be faster than their current software. While both nurses using CAS preferred it to the other software they had used, there were conflicting views on the extent to which the nurse used their clinical judgement, with one nurse feeling that CAS was more prescriptive and the other that it was less prescriptive than their previous software. Therefore we have very little information about nurses' views of the new software and the information we have is conflicting.

Interviewer: *So are you saying that the [other software] let you use more of your clinical background and Axa kind of asks the questions more for you?*

Nurse: *Yes, I think so, Axa's more (pause)....*

Interviewer: *Tighter?*

Nurse: *Yes, it is. (Nurse 24)*

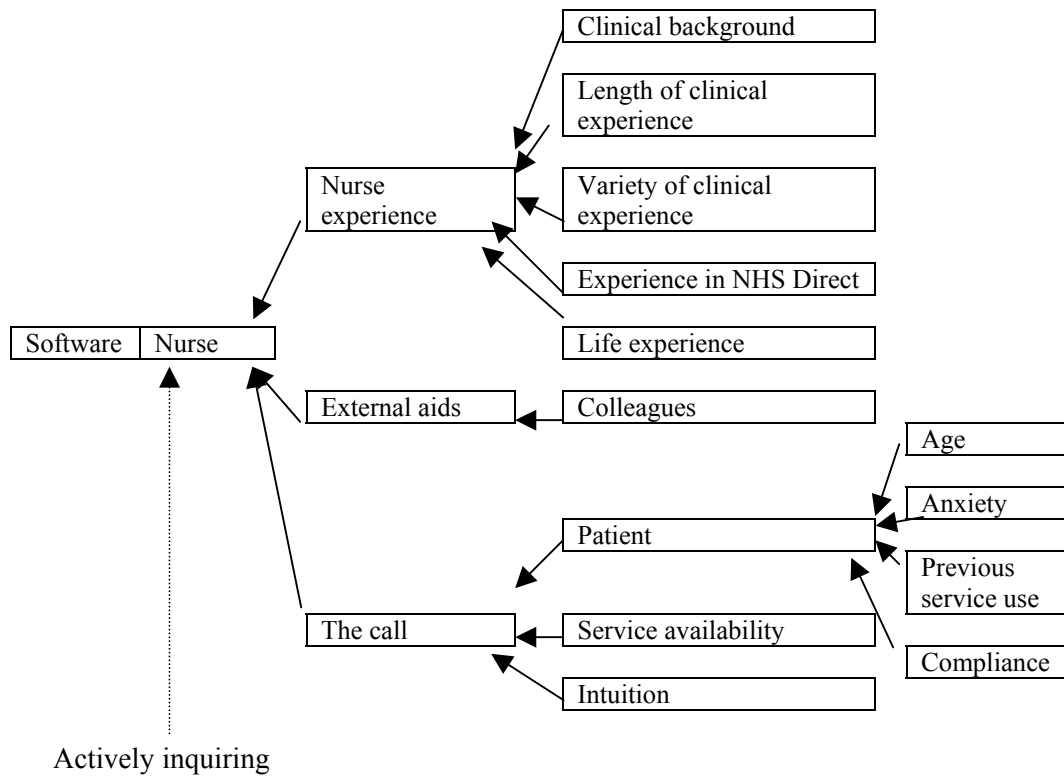
I actually prefer the Axa software to [other software]. I find it flows a little bit more, and it also, you are allowed to actually make more clinical decisions. (Nurse 12)

4.5 A variety of influences on clinical decision-making

We wanted to gain an understanding of the underlying processes which lead nurses to provide particular types of advice. Nurses felt that the software and the nurse are essential partners in the process of decision-making, with the nurse using the software as a support. The nurse takes the role of mopping up health problems which the software cannot deal with, is an active inquirer to ensure that sensible information is entered into the software and does not rely on the software to provide a recommendation but, through critical-thinking and communication skills, channels many issues into the decision-making process. Nurses bring to bear their own experience including clinical background, length and variety of clinical experience, experience in NHS Direct, and life experience; external aids such as their colleagues' experience; and issues specific to the call such as age and anxiety of the patient, availability of local services, and the nurse's 'gut reaction' or intuition (Figure 4.2).

When designing this study, we were interested in three influences on the clinical decision-making process - length and type of clinical experience and any interaction with the type of software used. Studying nurses' views of clinical decision-making suggests that some variation in decision-making should be expected by length and type of clinical experience. However, it has shown the complexity with which these factors can influence decision-making in that hospital nurses may recommend urgent care more than community nurses because they are used to dealing with serious/urgent/emergency patients and see the potential for problems to occur, or may be less likely to recommend urgent care because they are used to dealing with serious/ urgent/ emergency patients and feel that NHS Direct callers are not seriously ill enough to warrant an urgent response. It has also identified further influences on clinical decision-making, some of which we have been able to test quantitatively: variety of experience of nurse, length of experience in NHS Direct, and confidence (using the gender of the nurse).

Figure 4.2 Influences on clinical decision-making in NHS Direct, based on nurses' views



5. Discussion

Although consistency is an important goal for health services, variation exists in many services in the NHS, including triage services. Variation has been found in general practice in terms of referrals to secondary care, prescribing, and hospital admissions. GP referral to secondary care, where the GP acts as a gatekeeper to a service in the way that an NHS Direct nurse acts as a guide to services and self-care, shows wide variation at practitioner level¹⁷ and there is evidence of intra-doctor variation when standardised patients attend the same GP twice.¹⁸ Studies of triage in accident and emergency departments have shown a high level of consistency, or high levels of disagreement, with most suggesting a moderate performance.¹⁹ The use of protocols and computer programmes does not necessarily remove variability.^{11,20} Therefore we would expect to find variation in how different nurses dispose calls in NHS Direct.

5.1 Variations in clinical decision-making

The pattern of NHS Direct dispositions differed by the length of nurses' clinical experience. Nurses with more than 20 years clinical experience were more likely to dispose calls to self care than nurses with less experience. A relationship between length of clinical experience and triage decision has been found elsewhere, with more experienced nurses triaging more accurately than their less experienced colleagues.⁶ However, the effect of length of clinical experience has not been consistent in all studies. In a small study of triage nurses in emergency care, more experienced nurses assessed and categorised patients differently from their less experienced colleagues, but the direction of the difference depended on the type of problem.²¹ Another study found no relationship between length of experience and triage category, although numbers were small.²⁰

There was some evidence that the pattern of NHS Direct dispositions differed by nurses' type of clinical experience, with community nurses disposing more calls to self care than hospital nurses. However, this difference between nurse types was insignificant in comparison with variation between individual nurses. We could not locate any literature to support or refute this finding because the majority of literature on nurse triage is based on emergency services in the United States and has a focus on nurses with emergency care backgrounds. We were surprised that we did not find larger differences by type of clinical experience. Perhaps this is because we classified nurses by the type of experience in their most recent nursing post prior to NHS Direct when some nurses are not purely 'hospital' or 'community' but may have a mixture of these two backgrounds.

Any differences between length and type of experience of nurses were small and this is reassuring for those responsible for making decisions about the skill-mix of NHS Direct. However, differences in outcomes *overall* may not reflect all the differences that exist between nurses. The qualitative findings suggested that the process by which different nurses arrive at a decision may be dependent upon their backgrounds. Further to this, nurses perceived that their participation in the decision-making process was dependent on their specific expertise; that is, if they had experience and knowledge of the health problem they were dealing with then they were more likely to override the software recommendation, whereas a lack of knowledge made them more reliant upon the software. Studies of variation in triage which have focused on individual practitioners have found wide variation, for example the percentage of cases classified as urgent varied between 11% and 63% between

four nurses, two A&E doctors and two GPs.²² There may be considerable variation between individual nurses, the cause of which may be difficult to determine quantitatively. After all, quantitative studies of GP variation have largely failed to provide an explanation for referral rate variation in terms of patient, practice or GP characteristics, with little evidence that they are related to the age, use of investigations, or postgraduate qualifications of doctor.²³

5.2 The role of the software in clinical decision-making

Differences between types of nurses were small compared with differences between the three types of software, with Access more likely to dispose calls to urgent services, Centramax to routine services and TAS to self care. These differences mirror those found in two studies of standardised scenarios to nurses using the three software,^{1,24} and cannot be explained by sites having different relationships with their GP out of hours services. The introduction of a single software to NHS Direct will certainly improve the consistency with which NHS Direct calls are dealt with. However, consistency should not be confused with appropriateness and we are left with the important question of which software gives the most appropriate advice.

There was little or no support for the hypothesis put forward by the funders of this research that nurses with less experience would most suitably be matched with the most prescriptive software.

5.3 The consequences of variation on other health services

The type of software in use, rather than the skill mix of NHS Direct nurses, is likely to have an impact on other health services. The consequences of the type of software on 999 ambulance did not appear to be great: only 2% of calls to NHS Direct were disposed to this service and there was little variation between software. The consequences for A&E departments were larger, with Access disposing approximately half as many calls to this service as other software. The largest effect was on GP services, both immediate and routine. Access disposed twice as many calls to GP immediately than Centramax, and Centramax disposed twice as many calls to GP routine than the other two software, although these differences between the software were not wholly consistent for sites.

5.4 Clinical decision-making in NHS Direct

The nurses in our qualitative study perceived themselves to be active partners with the software used in NHS Direct, rather than simply computer operators. They described taking an active role, and making use of their clinical skills, during the decision-making process. Results from a questionnaire to all NHS Direct nurses⁷, which are reported in Appendix D, show that these results are in tune with the majority of nurses who reported that they always or often relied on their clinical experience in dealing with calls. In addition, the findings are echoed by NHS Direct nurses who did not participate in our study - *“you pick up vibes from the caller and use your clinical judgement.you can upgrade...but you can't downgrade”*.²⁵ It is worth noting that the picture emerging of an active inquiring nurse may represent the majority but not the whole of NHS Direct nursing. Approximately one in five nurses in the survey reported in Appendix D did not feel that they always or often relied on their clinical experience, and one nurse in our qualitative study felt that the repetitive nature of call-taking at busy times precluded this active inquiring role.

Our description of nurses' clinical decision-making processes in NHS Direct is similar to descriptions of triage,²⁶ nurse telephone triage,¹³ and nurse clinical decision-making in

general,^{14,16,27} where it has been shown that decision-making is affected by task complexity, levels of specialist knowledge, familiarity with the clinical setting, accessibility to health care, anxiety level of patient, colleagues, critical thinking skills, intuition, and history taking skills.

Given this active input from nurses, and their reliance on clinical experience, it is very surprising not to have found more variation between different types of nurses. The inability of quantitative analyses to explain variation in general practice referral to secondary care has led to an interest in qualitative studies of decision-making processes to explore cognitive factors such as propensity of an individual doctor to take or avoid risks in a clinical setting,²⁸ uncertainty and risk-taking in the face of uncertainty,²⁹ and interpersonal processes between the patient and the GP.^{29,30} Our qualitative study highlighted the importance of the confidence of the nurse when deciding whether to override the software recommendation. Although confidence levels may be determined in part by length and type of clinical experience, they seemed to operate in complex ways related to personality and specific experience, which require further exploration.

5.5 Limitations

For the quantitative study, our case-mix adjustment did not include health problems. However, we feel that the adjustments for age of patient and time of call were valuable. We assumed that ‘call-choosing’ would not occur amongst nurses. Our qualitative study revealed that this can happen but did not suggest that it was normal practice. We did not have usable data for all 17 sites. However, we had data from at least three sites using each of the software and this was acceptable for our analysis.

For the qualitative study, we obtained the names of nurses to interview through the site management. It is possible that management put forward their ‘best’ nurses or nurses who would protect NHS Direct’s reputation. Although this may have been true, some of the nurses chosen by management freely talked about their lack of confidence or were not afraid to give negative views about their service. However, we feel that there was bias due to nurses’ response to research. We found that when we sampled directly from one site, we had to try hard to convince nurses to participate in our research because they seemed wary and frightened of the research process. In addition, we did not seem to include in our study any of the 16% of nurses who find working for NHS Direct boring, although we did not ask nurses in our study about boredom (see Appendix D). Overall we feel that we had a variety of nurses, although somewhat biased towards nurses with degrees, an interest in research and management responsibilities, and biased towards nurses with an interest in reflecting on their work and likely to apply critical thinking within their work.

5.6 Interpretation of findings in the context of changes to NHS Direct

Two changes occurred to NHS Direct during the course of the study. First, in November 2000 the service expanded to 22 sites to cover the whole of England. Second, a decision was made to purchase one computerised decision support software to replace the three software currently in use. There is no reason to believe that the 22 sites differ in any way from the 17 sites in our study and therefore findings from this study can be generalised to all 22 NHS Direct sites. Of course variation due to the software will no longer be an issue when the common software is introduced across all sites. However, given the influence of the software on clinical decision-making in NHS Direct, and the lack of consistency between three types of software, it is important to address the appropriateness of advice given by the new software.

Given that disposition varied with length of clinical experience for all three types of software in this study, it is likely that this variation will exist for the new software.

5.7 Further research

Two issues merit further exploration. First, although *overall* nurses with hospital and community backgrounds give much the same pattern of advice, there is evidence from the qualitative study that they may bring different issues to bear during the decision-making process and may give different advice for individual calls. This might be particularly the case where a nurse has specialist knowledge or experience related to the call. It would be worthwhile exploring the extent to which specialist knowledge related to a call impacts on the disposition given. Since about a quarter of calls to NHS Direct are made on behalf of children under five, and nurses in this study identified a need for paediatric training (see Appendix C), it would be useful to explore this in the context of nurses' paediatric experience. A clinical audit in NHS Direct using three standardised paediatric scenarios found considerable variation between individual nurses²⁴ and a study in America using 15 standardised paediatric scenarios on triage nurses found extensive differences in dispositions.¹¹ The Medical Care Research Unit is planning research in which these 15 standardised paediatric scenarios are presented to NHS Direct nurses with and without recent paediatric experience to assess the contribution of specialist experience to the outcome of calls. Second, the issue of confidence and/or risk-taking behaviour demands further exploration, perhaps using a standardised measure of confidence to identify nurses with high and low levels of risk aversion and then comparing their triaging processes and outcomes using standardised case scenarios.

5.8 Guidance for skill-mix

How can this study guide NHS Direct in its quest for the most appropriate skill-mix? We have shown that length and type of clinical experience have very small effects *overall* on the pattern of dispositions given in NHS Direct, particularly in comparison with the effect of type of software. Yet there is variation between individual nurses and it is important to understand the causes of this variation, as well as studying the *appropriateness* of advice overall for the new software being introduced.

Some helpful guidance emerged from the study around skill-mix. First, since NHS Direct currently is made up largely of nurses with long years of clinical experience, NHS Direct is disposing the maximum amount of calls to self care, within other constraints. Second, nurses valued the variety of nurse backgrounds within a call centre because they drew on colleagues' experiences. Therefore, NHS Direct sites could ensure a good balance between hospital and community nurses within sites and facilitate sharing of experiences between nurses. Third, the skill of active inquiry or critical thinking may be a more important asset than background of nurse. Finally, other research we have undertaken with NHS Direct nurses⁷ has identified some dissatisfaction with on-going clinical training and concerns about loss of clinical skills. It may be worthwhile encouraging nurses to continue in hands-on clinical practice as well as working in NHS Direct.

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Appendix A: Multinomial regression

All the variables under study were available for 60,196 calls taken by 293 nurses in 11 sites. The 3-category triage variable was the outcome variable in a multinomial regression.

	Change in deviance	d.f.	F-ratio+	p-value
Nurse	9290	584		
Case-mix	2391	14		
Software	2356	4	$F_{4,580}=49.3$	<0.000
Length of experience	133	4	$F_{4,580}= 2.1$	0.05<p<0.1
Software x length	57	8	$F_{8,568} < 1$	
Type of experience	61	2	$F_{2,582}= 1.9$	0.05<p<0.1
Software x type	25	4	$F_{4,574}= 0.5$	
Specific type of experience	448	18	$F_{18,566}= 1.6$	0.05<p<0.1
Variety of experience	2	2	$F_{2,582}= 0.1$	
Length of time in NHS Direct	27	2	$F_{2,582}= 0.8$	
Gender of nurse	47	2	$F_{2,582}= 1.5$	

+ the F-ratios are calculated from the ratio of the deviance per degree of freedom explained by the terms to the remaining deviance per degree of freedom explained by them including a term for the 293 nurses.

Appendix B: Interview schedule

1. Could I take some background details?

Site _____

Software _____

Nursing experience _____

Number of years practising as a nurse _____

Number of months working on NHS Direct _____

2. Tell me what you think about the software you use

Prompt Good points

Bad points

3. What do you think contributes to reaching a decision about the recommendation to give to callers e.g go to A&E?

Prompt Role of the software

Role of the nurse

Role of the patient

Interactions between the above

4. Do you think that anything about YOU has an effect on the advice you give to callers?

Prompt What characteristics

Background

Length of nursing experience

Length of experience in NHS Direct

Other

Prompt What effect do you think these have on the advice you give?

5. What do you think is the ideal relationship between the software and the nurse when reaching a decision about the recommendation to give?

6. Tell me about when you upgrade or downgrade recommendations.

7. Do you think you make different decisions from any of your colleagues? Explain.

8. Do some nurses need the software more than others? Explain.

9. Describe the qualities and background of ideal NHS Direct nurse.

10. Is there anything else you would like to say?

Thank you for talking to me today

Appendix C: Other issues from the qualitative study

1. Nurses' views of working in NHS Direct

During the course of the interviews, several nurses talked generally about working in NHS Direct. They spoke about the benefits of the service, and how they coped with their new role. Nurses talked about the different stresses they faced in their job compared with their previous nursing roles. They considered the job to be very tiring and stressful, in a different way to other nursing jobs, and many found it took time to get used to, being used to TASK-orientated nursing. The broad array of subjects they were expected to cover appeared daunting at first, having to deal with any type of call and no longer having particular specialities.

I think I probably learned as much in these last four months as I did in four years in A&E. It feels like really a wealth of knowledge has come over. Cos you're dealing with all sorts, all sorts of calls, it could be anything you're dealing with. (Nurse 7)

No one knows what's going to be on the end of the phone. It's actually quite a scary process sometimes. Knowing that you are going to be taking the next one off the top of the queue. (Nurse 13)

Many nurses spoke about their initial nervousness with the job, finding it difficult to adjust from their more traditional nurse roles to providing telephone advice without being able to see the patient. The worries were compounded by the lack of follow-up and feedback for the majority of calls, as nurses couldn't judge whether they had delivered appropriate outcomes, hindering reflective practice.

We were so scared when we first started. You wouldn't believe it. (Nurse 1)

... you do have sleepless nights and you do worry about it and you think to yourself 'oh, have I missed anything'. I think that's the biggest thing. You're worrying in case you've missed something and you're chewing things over and over and over in your mind again. And I think the other thing that's difficult as well is the only feedback you get is when there is a complaint made. But if you were working in hospital and somebody came in very poorly and see them either die or get better. At least you would know what the end result was. (Nurse 23).

However, the sleepless nights that some encountered initially tended to diminish with time, as they got used to using the software and gained confidence in their own experience. After a few months, the nurses felt more comfortable and, although many commented that they still never knew what would come through the door next, their experience and knowledge gleaned whilst working in NHS Direct gave them more confidence and enabled them to deliver advice more effectively with problems they had encountered previously.

Nurses spoke about the support they received from colleagues and valued the supportive nature of their working environment. The back-up of advice from colleagues, information resources and the option to call the patient back after gathering information, or to check up on the patient, were all mentioned as factors which made them feel more comfortable in areas where they lacked knowledge themselves.

...it's better now there's team leaders because there's usually somebody who's not on a call so you can bounce ideas off each other, [...] Yes, I think you can't work in isolation (Nurse 17)

You have that option to actually stop the call and disappear and go off, sort your information and talk to your colleagues, do anything and phone back. If there wasn't that option I think people would leave this place in droves – it's your safety valve. (Nurse 13).

Despite the high turnover of staff that a couple of nurses mentioned, many of the nurses commented that they enjoyed their job and felt NHS Direct had a lot to offer. Those who mentioned their decision to come to NHS Direct had come because they felt they needed a change; a new challenge in their careers. Some commented upon how they thought NHS Direct was a long overdue service and wanted to be involved in the service.

Although aware of the adverse publicity and negative sentiments of other parts of the health service towards NHS Direct, they could see that patients were seeking necessary reassurance and wanted self care advice, as much as wanting to know they were right in contacting whatever service they were to contact. A few nurses talked of the role of care advice and providing reassurance, as they felt they had done this throughout their nursing careers, but that this was an improved evidence-based service, with advanced information substantiating their advice.

But even again you know you've got to take what the person on the other end says as, because I have friends that obviously from A&E that are ambulance men, and say that you know we send ambulances to patients that just don't warrant it. But as I say, I can only take what the patient says on the phone. (Nurse 14)

And I know there was a lot of, a back lash quite recently where GPs were saying well why should we pay these women to reassure the public but at the end of the day, I know in my last job, after I'd been there a little while a lot of people would just make an appointment to see me because they don't want to bother the doctor, and a lot of it was reassurance. (Nurse 23).

It was felt that NHS Direct should provide consistency of advice throughout the health service, and nationwide. Some perceived this as a problem, whether due to patients phoning up for second opinions on advice from other health professionals, or whether due to the difference in advice given by NHS Direct nurses throughout the UK. The differences between the NHS Direct sites were mentioned, as sites all have different management styles, lead nurse roles, structures and recruitment policies, which may affect the advice given.

2. Training needs

Nurses talked about the learning they gained 'on the job' – learning through doing, learning from the software, and learning from their colleagues. They spoke favourably about some training courses they had attended, for example a "calibration day" where the rationale behind key questions was explained so that all nurses had a consistent understanding, and training which involved listening to calls. Nurses did not ask directly for training but some fields were mentioned more than others as being difficult to handle, in particular **paediatrics, mental health, gynaecology, midwifery, and the computer.**

...there are very few people who are mental health trained and it, there does seem to be a little bit of nervousness with people between the general and the mental health, where they feel they're not experienced enough to take mental health calls (Nurse 3)

...it was one of these situations where your training is really as you do it, they give us enough training to work the system, to manage the system, plus what they thought, bits and pieces of what we need, and we are given every opportunity to add to that training. But really the training started when we actually picked the phones up and took the live calls, that's where we learn, from there onwards and its like anything in nursing - you can have all the theory and the practice but you've actually got to go and do it. (Nurse 20)

Because I haven't done a lot with paediatrics I am very concerned about young babies, and I do often seek another opinion and upgrade it as well.... I am not very happy with assessing a baby with a sore throat who is only like two months old, because its very difficult, and not having had a paediatric background, you know I don't feel happy at all....There's so many paediatric calls you know it would be helpful to develop that. You do do a lot at the beginning - the training - you do a lot on paediatrics and child protection which I know is an important part I think... but I think the general side of paediatric nursing would be you know more beneficial to begin with. (Nurse 11)

Keeping skills up to date was considered to be important. Some nurses continued to undertake clinical work outside NHS Direct to keep up to date. Three nurses suggested that **placements in different areas of the health service** would help and that variety could be achieved through rotating NHS Direct nurses around different parts of the NHS.

Once you're there, the ideal situation for me would be to be able to be seconded back into the acute sector, into primary care groups, into every area of nursing, mental health and midwifery, so that you can actually gain that knowledge. Perhaps, I don't know, perhaps a couple of weeks per area, a few weeks whatever, so you can build up some sort of competencies, and some knowledge of that area.....It is, after all, it is part of the NHS, we're not just a nurse on a telephone, it's part of the NHS and you rotate round hospitals and I feel we should be rotating round the NHS. That is the only way that we, in NHS Direct, can be consistent with our colleagues and that's what we need, we need consistency, we need to be safe. (Nurse 19)

3. The ideal NHS Direct nurse

Variety is the spice of life

There was no consistent view about the ideal background for an NHS Direct nurse. Some accident and emergency nurses felt that an A&E background was essential so that serious conditions were not missed, and that A&E nurses were well suited to NHS Direct because they had 'seen everything'. Some community nurses felt that a general practice background was essential because most calls to NHS Direct were minor, and that community nurses had the advantage of understanding the importance of someone's home circumstances in a decision. Perhaps the strongest message was that variety was considered to be the key – either a nurse with a varied background, or a team of nurses with a variety of backgrounds. However, nurses stated that no nurse could have experience in all specialties and needed help with their knowledge gaps from the software, colleagues and books.

I do think you need some A&E experience. Definitely, need A&E experience, plus a general nursing background. You know the ideal situation would be qualify as

a nurse, do so many, so much time on a surgical, so much time on a medical ward, then A&E, then come out of the community and then come into NHS Direct and I think then by that time that would take about ten years. And maybe community service like health visiting or midwifery, as a final thing that you do, and having done all that I think yes, we've got good skills to come into this job. (Nurse 20)

At the moment, its, with the type of work that presents itself to us, I think a wide range of family health, you know, I think practice nurses get very good exposure to that, wide population group. I think health visitors.... I think health visitors are very well, well prepared for most of this, except from my own point of view, we lack a bodily illness knowledge, a good generalist in combination with young family work is streets ahead. You get a nice combination of a practice nurse, a good up-to-date generalist, with community workers - such as a health visitor - you've got the perfect nurse advisor. (Nurse 13)

Critical thinking, communication skills, calmness

Nurses' beliefs about the importance of critical thinking skills have been detailed above. In addition to these skills, nurses felt that the ideal NHS Direct nurse needed to communicate well, and to stay calm.

But I think if I had to list the qualities that you'd have to have to be an NHS Direct nurse, communication would come top..... I think you've got to be a logical thinker, it's no good being a panicker, or a flapper, because at the end of the day you could get something that's acute on the phone. (Nurse 6)

I think it's very much communication, communication is the thing. The software is there and you use it, but I think if you have good communication skills then you can get round it. (Nurse 14)

4. Audit

Three nurses spoke favourably about listening to and reviewing their own calls. One nurse mentioned that management fed back the pattern of dispositions to individual nurses in an attempt to bring consistency to the service. The nurse expressed unhappiness about this because they felt that other issues could affect the statistics, such as shift patterns. This type of feedback could help to reduce variation between nurses, although it might be inappropriate unless it is adjusted for case-mix.

Appendix D: Audit of nurses working in NHS Direct

During June 2000 we approached the 17 NHS Direct call centres then in operation in England. In 15 centres, with the help of a local co-ordinator who provided a list of employed nurses, we sent a four page postal questionnaire to each NHS Direct nurse who had been in post for at least one month. In the remaining two centres, a list of nurses was not provided and the questionnaire was handed out to nurses by centre managers. Nurses who had not responded after two weeks were reminded by the local co-ordinator. A second questionnaire was sent to non-respondents after four weeks. The questionnaire was developed following face-to-face meetings with NHS Direct nurses and modified in the light of two pilot studies.

In all, 981 nurses were employed by NHS Direct call centres at the time of the survey, ranging from 27 to 101 at each centre. Of those able to reply, 74% (682/920) returned a completed questionnaire. In all, 6% (61/981) of nurses were unable to return a questionnaire during the survey period: 4% (38/981) had left the service, 1% (11/981) were on sick leave and 1% (9/981) were on maternity leave. The results relevant to the skill-mix study are reported below:

The majority of nurses felt that they relied on their clinical experience 'always' or 'often' and this did not differ by type of software (Table D.1). The majority of nurses felt that the software helped them to give advice, with Access more helpful than the other two software. However, the software was unable to handle some calls, with Access less likely to suffer from this problem. A minority (16%) of nurses felt bored during their shifts, with nurses using Access more likely to be bored than nurses using the other two software.

Table D.1 Percentage of nurses ticking 'always' or 'often' to statements about clinical decision-making by type of software.

	Access N=175	Centramax N=236	TAS N=264	All N=675
I rely on my clinical experience in dealing with calls	82%	80%	86%	83%
The software helps me in giving advice	87%	69%	75%	76% ***
There are problems the software can't handle	30%	39%	46%	40% ***
I get bored during my shifts	23%	14%	12%	16% **

** p<0.01, *** p<0.005

The relationship between reliance on clinical experience when dealing with calls and length of clinical experience was not statistically significant, although there was evidence that nurses with 20 or more years experience were less likely to rely on that experience than less experienced nurses (Table D.2). Nurses with 20 or more years of clinical experience were less likely to be bored during their shifts than other nurses.

Table D.2 Percentage of nurses ticking ‘always’ or ‘often’ to statements about clinical decision-making by length of clinical experience

	<10 years N=103	10-19 years N=302	20+ years N=244	All N=649
I rely on my clinical experience in dealing with calls	88%	83%	80%	83%\$
The software helps me in giving advice	79%	75%	77%	76%
I get bored during my shifts	20%	19%	9%	15%***
There are problems the software can't handle	40%	44%	34%	40%+

\$ tau p=0.046, + 0.05<p<0.1, *** p<0.005

Further results from this audit are reported elsewhere.⁷