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**Article:**

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NHS Direct: consistency of triage outcomes

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**Objectives:** To examine the consistency of triage outcomes by nurses using four types of computerised decision support software in NHS Direct.

**Methods:** 119 scenarios were constructed based on calls to ambulance services that had been assigned the lowest priority category by the emergency medical dispatch systems in use. These scenarios were presented to nurses working in four NHS Direct call centres using different computerised decision support software, including the NHS Clinical Assessment System.

**Results:** The overall level of agreement between the nurses using the four systems was “fair” rather than “moderate” or “good” (κ=0.375, 95% CI: 0.34 to 0.41). For example, the proportion of calls triaged to accident and emergency departments varied from 22% (26 of 119) to 44% (53 of 119). Between 21% (25 of 119) and 31% (37 of 119) of these low priority ambulance calls were triaged back to the 999 ambulance service. No system had both high sensitivity and specificity for referral to accident and emergency services.

**Conclusions:** There were large differences in outcome between nurses using different software systems to triage the same calls. If the variation is primarily attributable to the software then standardising on a single system will obviously eliminate this. As the calls were originally made to ambulance services and given the lowest priority, this study also suggests that if, in the future, ambulance services pass such calls to NHS Direct then at least a fifth of these may be passed back unless greater sensitivity in the selection of calls can be achieved.

METHODS

We constructed scenarios, or case vignettes, of calls to NHS Direct. We did not base these scenarios on actual calls made to NHS Direct, as the call information available might have been influenced by the software used. Instead, we used 119 calls about minor problems to three ambulance services, collected as part of two reviews of priority dispatch system performance. The 119 calls had all been assigned the lowest priority category by the priority dispatch systems used by the services, and all of the patients had been conveyed, but not admitted, to hospital. For each call, the patient report forms completed by ambulance service crews, the A&E department notes, and anonymised transcripts of the calls that had been made from the recorded call logs, were collated into a single scenario from which all personal and place names, locations, and dates were omitted. For example, one scenario was a young woman, calling from her workplace at midday on a Monday, with a swollen throat caused by a wasp sting; she had had the symptoms for three hours and had already contacted a GP about the incident. Another was for a 4 year old child who had fallen down some concrete steps on a Friday afternoon and had a number of cuts and bruises.

A single researcher presented these 119 scenarios in person to one NHS Direct nurse in each of the four call centres. The nurses had been working in A&E departments before joining NHS Direct and each had worked with their respective triage software for at least three months. The calls were presented in person and not on the telephone. Each of the calls was introduced in the same way by telling the nurse the day and time of day of the call (for example, ... “this call is being made on Monday at 7:30 pm”). Next the researcher introduced the problem about which they were calling using the description used by the original caller to the ambulance service. The researcher then answered factually each question asked by the NHS Direct nurse, if information was available. If a question was asked for which no factual information was available the researcher invented an answer consistent with the overall history, and recorded this question and answer so that the same
reply could be given to the same question when presenting the call to other NHS Direct call centres. At the end of the “call” the researcher recorded the outcome given by the nurse using the categories 999 ambulance, A&E department, GP immediately (up to four hours), GP later, other service, and self care. The length of calls was not recorded, but the researcher perception was that they lasted between 2 and 10 minutes and tended to be shorter where the outcome was for a 999 ambulance.

The patients who were the subjects of each of the 119 calls had been coded as a necessary or unnecessary attendance at an emergency department as part of a previous study. The classification used to determine the necessity of attendance at A&E was based on a validated measure of processes of care rather than diagnosis, and has been described elsewhere.

Analysis

Agreement between the triage systems was measured as the proportion of all calls that were managed in the same way, corrected for chance-agreement using Cohen's $\kappa$ statistic. There is a generally accepted view that values of $\kappa$ between 0.2 and 0.4 represent only “fair” agreement, with values of 0.4 to 0.6 being “moderate”, and values above 0.6 being “good”. The sensitivity and specificity of each system in predicting necessary attendance at an A&E department was calculated using the classification system referred to above as the “gold standard”.

RESULTS

The scenarios were similar to the types of calls received by NHS Direct, but they were not representative of NHS Direct calls. They were less likely to be made out of hours, less likely to be made by the patient, and less likely to be made on behalf of children, than calls to NHS Direct (table 1). About a quarter of the scenarios (27 of 118) were classified as unnecessary attendance at A&E, similar to the 24% unnecessary attendance found at eight A&E departments in another study. The triage outcomes for each system were very different (table 2). For example, the proportion of scenarios triaged to accident and emergency varied between 22% and 44%, and the proportion disposed to self care between 9% and 29%. The overall level of agreement between the nurses using the four systems was “fair” ($\kappa=0.375$, 95% CI: 0.34 to 0.41). Between 21% (25 of 119) and 31% (37 of 119) of these low priority

### Table 1 Characteristics of the 119 scenarios compared with NHS Direct calls

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Level</th>
<th>% scenarios (n=119)</th>
<th>% NHS Direct calls* (n=49219)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time and day of week</td>
<td>In hours (0800–1759 weekdays)</td>
<td>47%</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td>Out of hours</td>
<td>53%</td>
<td>71%</td>
</tr>
<tr>
<td>Caller</td>
<td>Patient</td>
<td>9%</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>91%</td>
<td>55%</td>
</tr>
<tr>
<td>Patient age</td>
<td>Child (0–14)</td>
<td>14%</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>86%</td>
<td>62%</td>
</tr>
<tr>
<td>Patient sex</td>
<td>Male</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>60%</td>
<td>57%</td>
</tr>
<tr>
<td>Necessity of attendance at A&amp;E†</td>
<td>Necessary</td>
<td>77%</td>
<td>Not available</td>
</tr>
<tr>
<td></td>
<td>Unnecessary</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

*Based on calls to three first wave NHS Direct sites. †Based on 118 calls for which classification available.

### Table 2 NHS Direct triage outcomes for the 119 scenarios by software*

<table>
<thead>
<tr>
<th>Advice</th>
<th>TAS (n (%))</th>
<th>Personal Health Adviser (n (%))</th>
<th>Centramax (n (%))</th>
<th>NHS Clinical Assessment System (n (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency ambulance</td>
<td>32 (26.9)</td>
<td>33 (27.7)</td>
<td>37 (31.1)</td>
<td>25 (21.0)</td>
</tr>
<tr>
<td>A&amp;E department</td>
<td>50 (42.0)</td>
<td>26 (21.8)</td>
<td>53 (44.5)</td>
<td>31 (26.1)</td>
</tr>
<tr>
<td>GP immediately</td>
<td>6 (5.0)</td>
<td>25 (21.0)</td>
<td>9 (7.6)</td>
<td>18 (15.1)</td>
</tr>
<tr>
<td>GP later/other professional</td>
<td>9 (7.6)</td>
<td>16 (13.4)</td>
<td>9 (7.6)</td>
<td>11 (9.2)</td>
</tr>
<tr>
<td>Self care</td>
<td>22 (18.5)</td>
<td>19 (16.0)</td>
<td>11 (9.2)</td>
<td>34 (28.6)</td>
</tr>
</tbody>
</table>

*The pattern of outcomes for NHS Direct triaged calls is 2%–3% to 999 ambulance, 15%–27% to A&E, 35%–49% to general practice and 33%–35% to self care.

### Table 3 Sensitivity and specificity of systems in predicting necessity of attendance at A&E departments (percentages)

<table>
<thead>
<tr>
<th></th>
<th>TAS</th>
<th>Personal Health Adviser</th>
<th>Centramax</th>
<th>NHS Clinical Assessment System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>70</td>
<td>51</td>
<td>78</td>
<td>49</td>
</tr>
<tr>
<td>Specificity</td>
<td>33</td>
<td>52</td>
<td>33</td>
<td>59</td>
</tr>
</tbody>
</table>

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ambulance calls were triaged back to the 999 ambulance service. The sensitivity of the systems, that is the proportion of necessary attendances triaged to A&E by each system, was high for two of the systems and low for two of the systems (table 3). Systems with higher sensitivity tended to have lower specificity—that is, they sent more unnecessary calls to A&E than the less sensitive systems. None of the systems had both high sensitivity and specificity.

DISCUSSION

We observed large differences in triage outcomes between different nurses using different software systems to triage the same calls. The level of agreement was higher than that reported in a previous study of inexperienced nurses using software to triage paediatric calls, where the $\kappa$ statistic was poor at 0.11.7 The nurses in our study were experienced and dealt with few paediatric calls—which may be more difficult to assess than adult calls—and therefore we might expect a better performance in our study. The sensitivity of NHS Direct to necessary attendance at A&E, of between 49% and 78%, compared well with a sensitivity of 54% found for 50 emergency calls triaged by telephone by nurses.17 However, our study has illustrated the difficulty in devising a software system that has both high sensitivity and specificity. The differences we have found were not subtle: for example, more than three times as many of our “callers” were advised to self care by the new NHS Clinical Assessment System than by one of the older systems. If this is the case in routine use then the NHS Clinical Assessment system may have more success in reducing demand on immediate care services than previous systems, but may also carry a greater risk of under-triage.

Strengths and limitations

Scenarios or case vignettes are widely used when assessing consistency of diagnosis and treatment in health services.18 19 and developing clinical guidelines using consensus methods.20 Cues included in the scenarios need to be selected with care, contextual cues should be made explicit, and it may not be best practice to include all possible scenarios.21 The cues in our scenarios were taken from real events and were consistent across the four presentations; we included the contextual cues of day and time; and we did not attempt to include all possible scenarios. The scenarios reflected the types of calls undertaken by NHS Direct—indeed none of the four nurses participating in our study expressed any concerns about the nature of the 119 calls. We did not attempt to simulate the process of NHS Direct calls but we feel that this did not adversely affect the study. The “calls” were undertaken face to face rather than by telephone, but the patient was not visible to the nurse during our scenarios in the same way they are not visible to NHS Direct nurses. The calls were shorter than NHS Direct calls because they did not include the checking of personal details, such as address and general practitioner, nor the conversation involved in “wrapping up” a call, issues that were not central to the outcome of the call. In fact, the main concern of the nurses in the study was that they could not probe the “caller” for enough information, a limitation of all scenarios that prevents them fully reflecting real life. This concern was expressed by all four nurses in our study.

The purpose of the study was to compare the four software systems rather than assess the appropriateness of the triage outcome. Thus consistency between all four presentations of the scenarios was the important issue. To this end, one researcher undertook all four presentations and made extra notes for each scenario at the first presentation, which she adhered to for further presentations. The first three systems were tested within two weeks of one another. However, the fourth system was tested several months later, after the same researcher re-familiarised herself with the process and used the same scenarios and notes and did not deviate from those notes. No external checks were made on consistency but we feel that there was a good level of consistency imposed by the adherence to written notes.

Finally, the variation found in our study may be attributable to variation between nurses as well as between software. TAS is an interpretative software allowing nurses to decide from available options the triage outcome they will recommend to the caller. Both Access and Centramax are more prescriptive and indicate the triage outcome for the nurse. In practice, nurses can over-ride the triage outcome offered by the software and we allowed them to do so in our study to reflect real life. Therefore our study compares nurses using the software rather than the software in isolation. Thus we are unable to disentangle the effect of different nurses and the effect of different software on triage outcomes in NHS Direct.

Implications

The variation we have observed is clearly not attributable to case mix, which was held constant. If the variation is mainly attributable to the nurse, then NHS Direct callers may expect quite different advice depending on who answers their call, raising a question about the experience and training needed by nurses to enable them to answer calls appropriately. If the variation is primarily attributable to the software, then standardising on a single system will obviously eliminate this. However, none of the four NHS Direct software systems tested to date seem to perform well on both sensitivity and specificity for necessity of attendance at A&E services, illustrating the difficulty in balancing the risks of over-triage and under-triage in such a system. It is clearly important that more detailed studies of the appropriateness of NHS Direct triage decisions are undertaken, with the aim of highlighting areas where improvements might be made.

As the calls used in this study were originally made to ambulance services and given the lowest priority by the emergency medical dispatch systems they used, this study also gives an indication of what may happen if, in the future, ambulance services pass such calls to NHS Direct instead of sending an emergency ambulance.18 At least a fifth of these may be passed back, potentially leading to delay in accessing care. Given that the desired end point is the appropriate use of emergency ambulances, it is important that further refinements are made to the types of low priority calls to be referred to NHS Direct and that operational protocols for such a system consider the possibility of calls being returned to 999 ambulance services so that the risks to the patient are minimised.

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Contributors

Alicia O’Cathain analysed the data, wrote the paper, and acts as guarantor. Elizabeth Webber presented the scenarios to nurses and contributed to interpretation of the findings and writing of the paper. Jon Nicholl designed the study and contributed to interpretation of the findings and writing of the paper. James Munro contributed to the design of the study, interpretation of the findings, and writing of the paper. Emma Knowles contributed to interpretation of the findings and writing of the paper. Brigitte Colwell undertook data administration.

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Conflicts of interest: none.
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