Effectiveness of appropriately trained nurses in preoperative assessment: randomised controlled equivalence/non-inferiority trial

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Abstract

Objective To determine whether preoperative assessments carried out by appropriately trained nurses are inferior in quality to those carried out by preregistration house officers.

Design Randomised controlled equivalence/non-inferiority trial.

Setting Four NHS hospitals in three trusts. Three of the four were teaching hospitals.

Participants All patients attending for assessment before general anaesthesia for general, vascular, urological, or breast surgery between April 1998 and March 1999.

Intervention Assessment by one of three appropriately trained nurses or by one of several preregistration house officers.

Main outcome measures History taken, physical examination, and investigations ordered. Measures evaluated by a specialist registrar in anaesthetics and placed in four categories: correct, overassessment, underassessment not affecting management, and underassessment possibly affecting management (primary outcome).

Results 1907 patients were randomised, and 1874 completed the study; 926 were assessed by house officers and 948 by nurses. Overall 121/948 (13%) assessments carried out by nurses were judged to have possibly affected management compared with 138/926 (15%) of those performed by house officers. Nurses were judged to be non-inferior to house officers in assessment, although there was variation among them in terms of the quality of history taking. The house officers ordered considerably more unnecessary tests than the nurses (218/926 (24%) *v* 129/948 (14%).

Conclusions There is no reason to inhibit the development of nurse led preoperative assessment provided that the nurses involved receive adequate training. However, house officers will continue to require experience in preoperative assessment.

Introduction

Reform of postgraduate medical training and the UK junior doctors' hours initiative have significantly reduced the amount of junior doctor time.[1–3] Together with the drive for efficiency savings, these changes have increased the pressure to substitute non-medical staff for preregistration house officers.[4]

Studies of the performance of nurses in preoperative assessment have been limited in size and scope.[5–9] We carried out a randomised controlled equivalence/non-inferiority trial of the effectiveness of appropriately trained nurses and preregistration house officers carrying out assessment in preoperative assessment clinics.

Methods

The trial was performed on four hospital sites in three NHS trusts. Patients were recruited from all those attending for assessment before general anaesthesia for general, vascular, urological, or breast surgery. We compared the competence of appropriately trained nurses and preregistration house officers in history taking, physical examination, and ordering of tests. Performance in each was scored as being "correct," "overassessment," "underassessment not affecting perioperative management," and "underassessment possibly affecting perioperative management." In the case of tests ordered both underassessment and overassessment could occur in the same patient.

One of two specialist registrars in anaesthesia examined each patient after the nurse or house officer. They carried out the initial assessment of performance by comparing their own assessment with that of the nurse or house officer. All assessments evaluated as underassessment that could affect management and an equal number of assessments sampled from the other three categories were reviewed by one of two consultant panels.

Nurse training

Three nurses were involved in this study, one at each of the study sites (one nurse covered two hospitals). They undertook the anatomy, physical examination, and test

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Table 1 Cases in which preoperative assessment by house officers or nurses possibly affected management in all centres

	No (%) assessed by house officers (n=926)	No (%) assessed by nurses (n=948)	Clinically important % difference*	Observed percentage difference (95 CI%)
History taking, physical examination, or test ordered	138 (14.9)	121 (12.8)	3.73	–2.1 (–5.3 to 1.09)
Underassessment:				
History taking	53 (5.7)	64 (6.7)	1.4	1.0 (–1.2 to 3.2)
Physical examination	46† (5.0)	40 (4.2)	1.2	–0.8 (–2.6 to 1.1)
Tests ordered	71 (7.7)	65 (6.9)	1.9	–0.8 (–3.2 to 1.5)
Overassessment:				
Test ordered	218 (23.5)	129 (13.6)	5.9	–9.9 (–13.4 to –6.4)

*(1.25×house officer %)–house officer %.
†n=925 as data on physical examination were missing for one patient.

ordering modules of taught masters courses in advanced practice or equivalent. Physical examination is not undertaken by most nurses carrying out preoperative assessment in the United Kingdom. Nurses were also supervised by a mentor, and a one month pilot recruitment phase identified logistical problems. Preregistration house officers received no training in preoperative assessment except that received during medical school education.

Recruitment and randomisation

Patients received an information leaflet with their clinic appointment letter. They were invited to participate and, if they agreed, to consent to randomisation at the assessment clinic. Preregistration house officers involved in this study outnumbered the nurses, so to avoid excessive delays we halted the recruitment and randomisation process when more than two patients were waiting to see a nurse.

Analysis

Our trial examined whether nurses performed worse than house officers and is thus a non-inferiority trial. This is a modification of an equivalence trial with the primary objective of showing that the response to an intervention is not clinically inferior to a comparative agent. A clinically important difference in performance was defined as 25% more than the control value, in this case the event rate for underassessment possibly affecting perioperative management among house officers. If the 95% confidence interval around the observed difference in event rates between the house officers and the nurses lay completely above the clinically important difference, then the performance of the nurse was judged to be inferior to that of the house officer; if it lay entirely below the clinically important difference it was judged to be non-inferior; if it straddled the clinically important difference, the result was judged uncertain.

We compared individual problems that could have affected perioperative management and unnecessary test ordering between the two trial arms by calculating relative risks and 95% confidence intervals.

Sample size

We established the expected event rate in the control arm during the pilot phase and calculated that we required 2250 patients (1125 in each arm of the trial) (see bmj.com).

Results

We sampled 354 clinics and approached 2070 patients. After exclusions, 1907 patients were randomised and 1874 were evaluated. Of these, 1011 were recruited from Southampton, 627 from Sheffield, and 236 from Doncaster; 926 patients were allocated to assessment by house officers and 948 to assessment by nurses. Baseline characteristics were similar in both groups, although the case mix differed between centres.

History, examination, and test ordering

In 259 cases history taking, examination, or test ordering was judged as underassessment possibly affecting management (table 1). The upper 95% confidence limit for the observed difference (1.1%) was less than the clinically important difference (3.7%), implying that appropriately trained nurses are no worse overall than preregistration house officers in assessing patients.

Assessment by consultants

The 259 cases in which assessment had been judged as underassessment possibly affecting management, and an equal sample of other cases, were reviewed by either of the consultant panels. No difference was made to the trial results by changes brought about by the consultants' judgments.

Separate analyses of outcome measures

Table 1 summarises the cases in which underassessment may have affected perioperative management. Non-inferiority in history taking was uncertain, the upper 95% confidence limit for the observed difference (3.2) being more than the clinically important difference (1.4). There was some heterogeneity between the nurses at the three centres, however, with 26/511 (5.1%) cases in Southampton, 18/319 (5.6%) in Sheffield, and 20/118 (16.9%) in Doncaster in which underassessment possibly affected management. No such differences were noted in examination and test

Table 2 Problems missed at history taking and examination that might have affected perioperative management, with relative risk (nurse risk/doctor risk) and 95% confidence intervals

	No assessed by house officers (n=926)	No assessed by nurses (n=948)	Total (n=1874)	Relative risk (95% CI)
Problems missed at history taking:				
Cardiac	15	18	33	1.18 (0.45 to 2.47)
Respiratory	6	13	19	2.12 (0.81 to 5.54)
Other	35	34	69	0.95 (0.60 to 1.51)
Problems missed at examination:				
Cardiac	17	24	41	1.38 (0.75 to 2.55)
Respiratory	3	5	8	1.63 (0.39 to 6.79)
Other	24	11	35	0.45 (0.22 to 0.91)

Totals exceed those given in table 2 as more than one problem was missed in four cases for history and three for examination.

Table 3 Tests not ordered or ordered unnecessarily that might have affected perioperative management, according to assessment by house officer (n=926) or nurse (n=948)

	Tests not ordered				Tests ordered unnecessarily			
	Assessed by house officers	Assessed by nurses	Total (n=1874)	Relative risk (95% CI)	Assessed by house officers	Assessed by nurses	Total (n=1874)	Relative risk (95% CI)
Electrocardiogram	47	35	82	0.73 (0.47 to 1.12)	18	16	34	0.87 (0.45 to 1.69)
Echocardiogram	26	23	49	0.86 (0.50 to 1.50)	32	18	40	0.55 (0.31 to 0.97)
Chest *x* ray	35	36	71	1.00 (0.64 to 1.59)	46	31	77	0.66 (0.42 to 1.03)
Urea and electrolytes	22	19	41	0.84 (0.46 to 1.55)	81	32	113	0.39 (0.26 to 0.58)
Liver function tests	15	24	39	1.56 (0.83 to 2.96)	45	24	69	0.52 (0.32 to 0.85)
Clotting function	11	2	13	0.18 (0.04 to 0.80)	34	5	39	0.14 (0.06 to 0.37)
Crossmatch/group and save	8	5	13	0.61 (0.20 to 1.86)	13	5	18	0.38 (0.13 to 1.05)
Pulmonary function tests	8	11	19	1.34 (0.54 to 3.32)	4	5	9	1.22 (0.33 to 4.53)
Haematology (for example, full blood count)	6	10	16	1.63 (0.59 to 4.46)	39	6	45	0.15 (0.06 to 0.35)
Cervical spine/thoracic inlet *x* ray	2	2	4	0.98 (0.14 to 6.92)	4	1	5	0.24 (0.03 to 2.18)
Other	21	24	45	1.12 (0.63 to 1.99)	35	21	56	0.59 (0.34 to 1.00)

ordering. Table 1 also shows that house officers order nearly twice as many unnecessary tests as nurses.

Table 2 shows problems missed during history taking and examination. Although there was a tendency for nurses to detect fewer cardiorespiratory problems, nurses were significantly better at picking up non-cardiorespiratory problems at examination. Overall, Doncaster provided fewer patients than the other sites, and the poor history taking could be due to limited experience.

Table 3 details those tests that were not ordered and that might have affected perioperative management. There were no differences except for clotting function, though this may be a chance finding. Table 3 also details the tests that were ordered unnecessarily. House officers ordered significantly more tests, particularly ones that might be regarded as "routine" (urea and electrolytes, liver function tests, and haematology) but also echocardiography and clotting function tests.

Discussion

Appropriately trained nurses were no worse than preregistration house officers in assessing patients preoperatively, although it might be argued that neither group performed particularly well. Patients face a one in seven chance of a house officer failing to detect something that might affect perioperative management and a one in eight chance of an appropriately trained nurse doing the same.

Although this trial did not reach its planned size, the likely effect of under-recruitment would have been to introduce wider confidence intervals around percentage differences between nurses and house officers, leading to uncertainty in terms of non-inferiority. This happened only in terms of history taking. Although specialist registrars could not be blinded as to whether assessments were being performed by a nurse or a house officer, our expert panel found no evidence of systematic bias. There was clear variation in the ability of appropriately trained nurses to take patient histories, one site being different from the other two. The extent of this variation could be because we evaluated only three nurses, and ideally we would have used more but training costs precluded this. Low recruitment might still provide the explanation for variation in the ability to take patient histories because it led to lack of practice in history taking. This implies that there needs to be not only specific training for this extended role, but also an assessment of competence before a nurse takes up independent practice.

House officers ordered significantly more unnecessary investigations than appropriately trained nurses. Preoperative investigations in all the study centres were largely determined by protocol, and appropriately trained nurses adhered to protocol more than house officers. This has clear economic implications.

For most hospitals in the United Kingdom there will not be enough house officers to carry out preoperative assessment, but some experience is necessary for their training. It is clear that they cannot be replaced entirely by nurses, even if this is seen as a role within which nurses could develop a career.[10]

What is known already on this topic

Reform of postgraduate medical training and junior doctors' hours have reduced the amount of junior doctor time available for the requirements of the NHS

In many hospitals preoperative assessment has been taken over by non-medical staff, usually by appropriately trained nurses

What this study adds

Appropriately trained nurses perform no worse than preregistration house officers in the process of preoperative assessment

Variations in performance in nurses were similar to those commonly observed between preregistration house officers

House officers order substantially more unnecessary tests than nurses

With appropriate training nurses have the skills necessary to undertake preoperative assessment to the same level as preregistration house officers, though neither group performed particularly well in this study

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Withholding the artificial administration of fluids and food from elderly patients with dementia: ethnographic study

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Abstract

Objective To clarify the practice of withholding the artificial administration of fluids and food from elderly patients with dementia in nursing homes.
Design Qualitative, ethnographic study in two phases.
Setting 10 wards in two nursing homes in the Netherlands.
Participants 35 patients with dementia, eight doctors, 43 nurses, and 32 families.
Results The clinical course of dementia was considered normal and was rarely reason to begin the artificial administration of fluids and food in advanced disease. Fluids and food seemed to be given mainly when there was an acute illness or a condition that needed medical treatment and which required hydration to be effective. The medical condition of the patient, the wishes of the family, and the interpretations of the patients' quality of life by their care providers were considered more important than living wills and policy agreements.
Conclusions Doctors' decisions about withholding the artificial administration of fluids and food from elderly patients with dementia are influenced more by the clinical course of the illness, the presumed quality of life of the patient, and the patient's medical condition than they are by advanced planning of care. In an attempt to understand the wishes of the patient doctors try to create the broadest possible basis for the decision making process and its outcome, mainly by involving the family.

Introduction

Withholding the artificial administration of fluids and food, especially in incompetent patients in nursing homes, and the benefit of such practice in patients with advanced dementia are both well debated topics. We aimed to determine the decision making process behind withholding the artificial administration of fluids and food in incompetent patients.[1]

Methods

Our qualitative, ethnographic study was conducted in two phases.[2 3] The first phase (October 1998 to April 1999) was carried out by RP in a nursing home (201 beds) in a rural part of the eastern Netherlands. The second phase (December 1999 to February 2001) was carried out by AT in a nursing home (210 beds) in the more urbanised western Netherlands.

For 7 months RP investigated the practice of withholding the artificial administration of fluids and food by the staff. The time frame was too short to understand decision making when illnesses had longer trajectories, and the attitudes of the other professionals were not sufficiently clear. The study period for phase 2 was therefore increased to 14 months, on a part time basis, 3 days a week. Owing to media attention surrounding the practice of withholding the artificial administration of fluids and food, the staff of both nursing homes were initially conscious of the researchers. The researchers observed but did not participate in the decision making process. The findings and conclusions were submitted to the participants and discussed in formal interviews conducted at the end of both phases.[4]

Overall, 35 of the patients (28 women) were candidates for the withholding of the artificial administration of fluids and food. Their ages ranged from 61 to 98 years. Eight doctors, 32 families, and 43 nurses were observed in the decision making process.

Analysis

Our analysis and results are based on four types of data[4]: comprehensive notes made by the researchers; formal interviews (taped and fully transcribed); medical and nursing records; and a diary kept by the researchers of their own behaviour and attitudes.