

An evaluation of a nurse-led ear care service in primary care: benefits and costs

MARGARET FALL

STEPHEN WALTERS

SUSAN READ

MARK DEVERILL

MARK LUTMAN

PHILIP MILNER

ROSEMARY RODGERS

SUMMARY

Background. Nurses trained in ear care provide a new model for the provision of services in general practice, with the aim of cost-effective treatment of minor ear and hearing problems that affect well-being and quality of life.

Aim. To compare a prospective observational cohort study measuring health outcomes and resource use for patients with ear or hearing problems treated by nurses trained in ear care with similar patients treated by standard practice.

Method. A total of 438 Rotherham and 196 Barnsley patients aged 16 years or over received two self-completion questionnaires: questionnaire 1 (Q1) on the day of consultation and questionnaire 2 (Q2) after three weeks. Primary measured outcomes were changes in discomfort and pain; secondary outcomes included the effect on normal life, health status, patient satisfaction, and resources used.

Results. After adjusting for differences at Q1, by Q2 there was no statistical evidence of a difference in discomfort and pain reduction, or differential change in health status between areas. Satisfaction with treatment was significantly higher ($P = 0.0001$) in Rotherham (91%) than in Barnsley (82%). Average total general practitioner (GP) consultations were lower in Rotherham at 0.4 per patient with an average cost of £6.28 compared with Barnsley at 1.4 per patient and an average cost of £22.53 ($P = 0.04$). Barnsley GPs prescribed more drugs per case (6% of total costs compared with 1.5%) and used more systemic antibiotics ($P = 0.001$).

Conclusions. Nurses trained in ear care reduce costs, GP workload, and the use of systemic antibiotics, while increasing patient satisfaction with care. With understanding and support from GPs, such nurses are an example of how expanded nursing roles bring benefits to general practice. Nurses trained in ear care reduce treatment costs, reduce the use of antibiotics, educate patients in ear care, increase patient satisfaction, and raise ear awareness.

M Fall, BSc, project manager, research associate, and S Walters, MSc, statistician, University of Sheffield, Sheffield. S Read, PhD, RGN, RHV, project leader, senior lecturer (research), Acute and Critical Care Department, Sheffield University School of Nursing and Midwifery, Sheffield. M Deverill, MSc, health economist, University of Sheffield, Sheffield. M Lutman, PhD, professor of audiology, Institute of Sound and Vibration Research, University of Southampton. P Milner, BA, MBA, MChB, MRCP, FFPHM, professor of public health, University of Bath. R Rodgers, RGN, director, Primary Ear Care Centre, Rotherham Health Authority. Submitted: 12 June 1996; accepted 24 June 1997.

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Introduction

EAR and hearing problems are seldom life-threatening but cause pain, discomfort, and embarrassment to many people, and thus affect well-being and quality of life.^{1,2} The Rotherham Primary Ear Care Agency,³ initiated in 1990 by the Rotherham health authorities and later supported by Trent Region's Clinical Development Fund, aims to enable more patients to be treated for minor ear problems in primary care settings, reducing referrals and freeing consultant time.

Practice nurses received specialized training in the structure and functioning of the ear, enabling them to recognize and treat people with ear or hearing problems; they also receive basic audiometry training. All training is supported by an ear, nose and throat (ENT) consultant and the agency specialist ear nurse. Patients may self-refer to the dedicated ear care clinics where the trained nurses advise, treat, and refer to GPs and, via GPs, to hospital consultants or audiology clinics as necessary.⁴⁻⁷ Practices gradually develop a state of 'ear awareness'.

We undertook a prospective observational cohort study to compare outcomes and resource use in patients with ear or hearing-related problems who were treated in general practice, either in Rotherham by nurses trained in ear care or in Barnsley by standard practice. Outcome measures did not cover clinical competence but did include hearing and ear problems and patient health status, patient satisfaction, and cost implications. A detailed description of the study has been submitted to NHS Executive Trent.

Method

The study was approved by the appropriate ethics committees. Patients with ear or hearing problems who were treated in eight Rotherham practices where ear care nurses (ECNs) had been in operation for at least six months were compared with those in nine Barnsley practices without nurses trained in ear care. During the study, practices were paid receptionist rates for one hour per week to compensate for receptionist time spent identifying suitable patients. Barnsley practices were offered part of the cost of training an ear care nurse that was normally paid for by the practice at the end of the study.

From June until December 1995, questionnaires were issued to all patients, aged 16 and over, presenting at surgery for consultation about painful, itching, or discharging ears, excessive ear wax or hearing impairment, or with long-standing ear disease.⁸⁻¹² The first questionnaire (Q1), to be completed before treatment, measured the nature, severity, and symptoms of patients ear or hearing-related problems and their health status on the day of consultation, and allowed for general comments. Three weeks later, patients who had completed Q1 were invited by post to complete a second questionnaire (Q2) to record details of treatment received, visits and referrals made, changes in symptoms, current health status, and satisfaction with care. A full description of the questionnaire is available from the authors.

Q1 and Q2 included questions from the Medical Research Council's Hearing Research Institute instruments¹³ relating to discomfort, pain, sleep disturbance, disruption to normal activity and social, family, and work life, embarrassment and worry caused by ear and hearing problems, and also satisfaction with treatment given, and ear-related expenditure. Quality-of-life information was incorporated into both questionnaires using the recently developed HSQ-12 (Health Status Questionnaire)¹⁴⁻¹⁵ with eight dimensions of perceived health scored on a 0-100 scale, where 100 is equivalent to 'good' health.

Examination of the GP notes of all study patients provided demographic and resource use information. Telephone interviews with four ECNs and three practice or district nurses recorded current treatment practice and nurse satisfaction.

The outcome used for determining sample size was a difference in the proportion of patients in each area reporting a reduction or no change in discomfort related to the ear or hearing problem when they returned Q2, compared with the level of discomfort reported at Q1. Because of the anticipated difficulty in recruitment in Barnsley, due to lack of 'ear awareness', twice as many patients were to be recruited in Rotherham as in Barnsley.

It was judged that a difference of 10% between the groups in the proportion of patients experiencing a reduction or no change in discomfort was practically relevant. Therefore, if 70% of patients in one group and 80% of the patients in the other group experience a reduction or no change in discomfort at follow-up, then, for an 80% chance of detecting such a difference, 660 patients (440 from Rotherham and 220 from Barnsley) would be needed.

For interval and ordinal measurements (e.g. age, number of GP visits, HSQ-12 dimension scores), Mann-Whitney tests of significance were used. For categorical measurements (e.g. sex, pain), chi-squared (χ^2) tests were used. Analysis of covariance methods¹⁶ were used to compare the changes in HSQ-12 dimension scores from Q1 to Q2 between areas, taking into account any differences in the initial scores. Similarly, for the categorical outcomes measured at three weeks (e.g. pain, discomfort), log-linear modelling¹⁷ was used to look for associations between area and outcome at Q2, after adjusting for differences in the initial level at Q1.

In the evaluation of resource usage, time estimates for practice nurse consultations were based on a questionnaire given to practice nurses in several Rotherham and Barnsley practices. Cost calculations used nationally published figures¹⁸ for GP and practice nurse (PN) consultations. The cost per consultation with an ECN includes the part of the Ear Care Agency (ECA) budget that could be directly attributed to supporting the care of patients at practice level.

Secondary care costs (audiology and ENT outpatient visits) were taken directly from prices quoted to GP fundholders by the two provider units in Rotherham and Barnsley, and drug prices from the British National Formulary (BNF) and Monthly Index of Medical Specialties (MIMS). Patient travel costs were from self-report in patient questionnaires.

Mean costs per patient in the two groups were compared by a permutation test procedure.¹⁹ Mean cost differences were calculated and 95% confidence intervals (CI) produced by bootstrap methods.

Results

Of 949 eligible patients, 790 (83%) agreed to participate in the study. One hundred and fifty-six of these failed to return Q2 (a secondary response rate of 80%), leaving 634 patients (438 from Rotherham and 196 from Barnsley). Response rates were very close between the areas at Q1, and identical at Q2.

The median age of responders was 54 years (interquartile range 38-67 years); 47 % were female and 53% had previously visited the practice in the previous 12 months with an ear or hearing-related problem. The characteristics of non-responders at Q1 were similar to those of responders, but at Q2 they were more likely to be younger, male, and new cases, and more likely to report more pain and loss of sleep. Responders and non-responders had similar HSQ-12 scores at Q1.

No meaningful pattern of statistical differences (at the 5% level) was found between all of the consulting patients and those patients presenting with a new episode only, so the results are based on all patients.

Table 1 shows the characteristics of the 790 patients who completed Q1. Barnsley patients reported that ear problems caused more discomfort and pain, and had a greater effect on everyday life, than did Rotherham patients (Table 2). Rotherham patients had higher HSQ-12 dimension scores at Q1 on all eight dimensions and hence better self-perceived health (Table 2).

After treatment, the responses obtained on Q2 were adjusted to take into account the initial level of response. Rotherham patients fared slightly better in terms of reduction in discomfort at Q2 ($\chi^2 = 19.33$, $df = 12$, $P = 0.08$), but showed no difference in pain reduction ($\chi^2 = 12.86$, $df = 12$, $P = 0.40$) compared with patients in Barnsley. Within the factors affecting everyday life, it was only in normal activities that any evidence of differing outcomes was detected ($\chi^2 = 9.32$, $df = 2$, $P = 0.01$). The mean health gains (HSQ-12) were less than seven points after Q2 for both patient groups, and in no dimension was there a significant difference, even after adjustment for the higher initial health status of Rotherham patients at Q1.

Table 1. Characteristics of practices and responders in the study.

	Barnsley	Rotherham	
Practice characteristics (median)			
Social deprivation: Jarman score (range)	+50 (3.2-10.7)	+4.5 (-12.2-12.5)	
Practice population (range)	5591 (791-8373)	7125 (3142-10 800)	
Number of GPs (range)	3.0 (1-4)	3.5 (1-6)	
Responders	Maximum $n = 245$	Maximum $n = 545$	<i>P</i> values
Percentage of female patients	46.1	48.0	$P = 0.63$
Percentage of new ear patients	63.6	47.5	$P = 0.0001$
Median (IQR) age in years	54 (37-65)	55 (38-68)	$P = 0.29^*$
Median (IQR) number of visits to GP in three months after first questionnaire	1.0 (1.0-1.0)	0.0 (0.0-1.0)	$P = 0.0001^*$

IQR, interquartile range. *P* values are for χ^2 tests, except *Mann-Whitney tests.

Table 2. Health status of responders at Q1.

		Barnsley (minimum <i>n</i> = 225) %	Rotherham (minimum <i>n</i> = 488) %	<i>P</i> values
How much discomfort have you had in the last week, including today, from your ear or hearing problem?	None	6.0	12.0	<i>P</i> = 0.0002
	Slight	19.1	24.7	
	Moderate	37.4	40.3	
	Severe	30.6	20.0	
	Extreme	6.8	3.0	
How much pain have you had in the last week, including today, from your ear or hearing problem?	None	32.6	47.7	<i>P</i> = 0.0002
	Slight	18.9	20.0	
	Moderate	26.6	20.2	
	Severe	18.5	10.3	
	Extreme	3.4	1.9	
During the last week, has your current ear or hearing problem affected your normal activities?	Yes	45.0	31.4	<i>P</i> = 0.0003
Is your current ear or hearing problem affecting your sleep?	Yes	45.3	27.2	<i>P</i> = 0.0001
HSQ-12 dimension scores		Median (IQR)	Median (IQR)	<i>P</i> values
Physical functioning		83 (33–100)	100 (50–100)	<i>P</i> = 0.03*
Role — physical		65 (25–100)	100 (25–100)	<i>P</i> = 0.001*
Bodily pain		65 (45–100)	85 (65–100)	<i>P</i> = 0.0001*
Health perception		60 (25–85)	60 (60–85)	<i>P</i> = 0.002*
Energy/fatigue		40 (20–80)	60 (40–80)	<i>P</i> = 0.04*
Social functioning		75 (50–100)	100 (75–100)	<i>P</i> = 0.004*
Role — mental		65 (45–100)	100 (65–100)	<i>P</i> = 0.001*
Mental health		60 (47–80)	72 (53–87)	<i>P</i> = 0.0004*

P values are for χ^2 tests, except *Mann-Whitney tests, IQR, interquartile range.

At the initial surgery appointment, Barnsley patients were more likely to see the doctor, receive a prescription, and be asked to come back to see a doctor, whereas Rotherham patients generally saw a nurse and were asked to come back and see a nurse (Table 3). Although satisfaction with the treatment received was high (Table 3) in both groups, it was higher in Rotherham.

In Rotherham, there were 172 GP consultations (average of 0.4 per patient), making up 18% of total costs (average cost per patient £6.28), compared with 276 in Barnsley (average 1.4 per patient), which accounted for 50% of total costs (average cost per patient £22.53). There were 2.0 visits per patient to the ECN in Rotherham compared with 0.6 visits per patient to a PN in Barnsley. Consequently, the contribution to total costs of care by ECNs was higher (35%) than that of PNs (7%), but these did not significantly offset the cost savings in Rotherham resulting from reduced use of GP time.

GPs in Barnsley prescribed more drugs per case (6% of total costs compared with only 1.5% in Rotherham) and more systemic antibiotics (36 prescriptions compared with 26 in Rotherham, χ^2 - 23.71, *df* = 1, *P* = 0.0001). Previous work^{9,10,20-22} has suggested that the use of these drugs is often inappropriate for the condition(s) being treated and represents wasted resources.

Table 4 compares the breakdown of costs in Barnsley and Rotherham for the study patients and shows marked differences. The cost of providing the ear care service (estimated at a total of £1.38 out of a base case cost per consultation of £6.88, or 20% of the cost per each ECN-patient consultation) is balanced by lower GP costs in Rotherham, whereas GP drug prescriptions are higher in Barnsley. The average total costs per case is significantly lower when using ECN (£9.68 less in Rotherham, 95% confidence interval (CI) £19.68 – £1.16; *P* = 0.04). This difference in total cost per case proved robust when sensitivity analysis was carried out on the time spent in each consultation by ECNs and PNs.

All-age, all-condition referrals to Rotherham and Barnsley ENT consultants from study practices (1996 hospital information data) give a local referral rate for Barnsley study practices of 19.3 per 1000 practice population, almost double that of the Rotherham study practices at 10.1 local referrals per 1000 practice population, a difference of 9.2 referrals per year (95% CI 7.7 to 10.7) per 1000 practice population. This finding was not confirmed within this study and needs further investigation.

Qualitative data from interviews with ECNs indicated that Rotherham patients had a greater knowledge of their condition and that they appreciated the availability of specialist nurse

Table 3. From Q2: initial contact, return visits, prescriptions received, and satisfaction with treatments.

	Barnsley (minimum <i>n</i> = 189) %	Rotherham (minimum <i>n</i> = 395) %	<i>P</i> values
Initial contact			
Doctor	65.4	16.6	
Nurse	7.9	64.0	
Both	26.7	19.4	<i>P</i> = 0.0001
Return visits	Yes	Yes	
Asked to come back and see doctor	31.3	15.1	<i>P</i> = 0.0001
Asked to come back and see nurse	26.9	59.8	<i>P</i> = 0.0001
Received a prescription for ear problem	56.8	25.5	<i>P</i> = 0.0001
Patient satisfaction with treatment received			
Extremely dissatisfied	4.2	4.0	
Dissatisfied	13.8	5.0	
Satisfied	44.4	37.6	
Very satisfied	37.6	53.4	<i>P</i> = 0.0001

P values are for χ^2 tests.

Table 4. Comparison of costs for Rotherham and Barnsley patients.

Category	Costs £ (% of total)		Average cost (£) per 100 study patients	
	Rotherham (<i>n</i> = 438)	Barnsley (<i>n</i> = 196)	Rotherham	Barnsley
PN visits ^a	–	585.60 (6.6)		299
ECN visits ^b	5455.84 (34.9)	–	1245	
GP visits	2752.00 (17.6)	4416.00 (49.9)	628	2253
Drugs GP	233.61 (1.5)	528.32 (5.9)	53	270
Drugs PN	175.59 (1.1)	3.85 (0.0)	40	2
Audiology OP	189.90 (1.2)	228.00 (2.6)	43	135
ENT OP	2957.78 (18.9)	1175.00 (13.2)	675	695
Hospital drugs	19.23 (0.1)	22.65 (0.3)	6	11
Alternative non-NHS care	300.00 (1.9)	250.00 (2.8)	68	148
Patient travel	89.50 (0.6)	52.50 (0.6)	20	31
OTC medicines	3450.00 (22.1)	1626.50 (18.3)	788	830
Total cost for all patients	£15 624.00	£8 888.42		
Average cost per patient	£35.67	£45.35		
Range	£0.50–£604.24	£4.80–£490.30		
Difference in average cost per case (95% CI)	–£9.68 (–£19.86 to –£1.16)			

OP, outpatient clinics secondary care; OTC, over-the-counter medicines. ^aCost based on an average consultation time of 12 minutes. ^bCost based on an average consultation time of 13.5 minutes with initial nurse training costs being defrayed over five years and initial start equipment being depreciated over three years.

advice. The ECNs showed enthusiasm for their new role, the training they had been given, and the opportunity to practise in a specialized field.

Discussion

This study shows that nurses trained in ear care reduce overall treatment costs, GP workload, the use of systemic antibiotics, and referrals to ENT; patient satisfaction is increased and there is no difference in perceived overall health status. However, because of the observed ceiling effects on the HSQ-12, we have some doubts about the sensitivity of the HSQ-12 instrument to detect the condition-specific changes in health status experienced by the patients after treatment for ear or hearing problems. A possible alternative explanation for the lack of health status gain is that the sample size was not based on the expected difference between the two patient groups in the HSQ-12 scores; with a

larger sample, it may have been possible to identify differences. Also, the three-week time period between Q1 and Q2 may be too short or did not coincide with the time when patients experienced improvement. This may explain the inconsequential health gains experienced by patients in both areas. Patient satisfaction is not the primary goal of health services but it is an important dimension of the quality of health services. We have shown that satisfaction among patients with ear or hearing problems was higher when they were first seen and managed by ear care nurses.

Many doctors entering general practice have received little ENT training.²¹ Patients are frequently reticent about consulting their GP with ear or hearing problems and have low expectations of help. High levels of satisfaction were recorded for both Barnsley and Rotherham patients, but Rotherham patients specifically highlighted the knowledge and helpfulness of ECNs, which had increased their understanding of their own ear problems and how to manage them. ECNs who initially had reserva-

tions about the ear care training soon recognized benefits to themselves and patients.

A number of conditions need to be met for an ear care service in primary care to work successfully and to allow the cost savings to be realized. Practice nurses must receive recognized initial training and attend subsequent refresher courses. The local ENT consultants must support the principles of ear care training and be prepared to refer routine hospital treatments back to the surgery for local care by the nurses; e.g. dressings by insertion of wicks. For maximum effect, patients should be able to self-refer to ECNs, allowing trust to develop between patient and nurse. This shifts the responsibility for early recognition of problems towards patients, who are then supported by informed and readily available expert help from the practice nurse. General practitioners need to feel comfortable working with nurses with additional skills as part of a treatment team.

If ECNs raise awareness of ear care problems in patients, and hence lead to an increase in the number of patients seen in such practices, there are potential cost implications. Any extra demand for care as previously 'unmet need' is dealt with may lead to increased short-term cost pressures on GP budgets. However, it is possible that, by dealing with problems in a more timely and effective manner, the overall costs of treatment will be reduced. The lower symptom scores and better self-perceived health of the Rotherham patients at Q1 may reflect the benefit of pre-existing provision. Of course, some of the longer-term cost savings may occur at the secondary level, as more prompt primary care saves secondary treatment later.

Ear care training is an example of an expanded role^{4,5} available to practice nurses, which brings a new dimension to the service offered in primary care, benefiting patients, doctors, and nurses.

The study findings fully support the work of nurses trained in ear care in general practice. Further work is needed to investigate whether they reduce referrals to, and hence costs in, secondary care.

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Address for correspondence

Mrs M Fall, Medical Care Research Unit, University of Sheffield, Regent Court, 20 Regent Street, Sheffield S1 4DA.



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