

Impact of nurse practitioners on workload of general practitioners: randomised controlled trial

Miranda G H Laurant, Rosella P M G Hermens, Jozé C C Braspenning, Bonnie Sibbald, Richard P T M Grol

Abstract

Objective To examine the impact on general practitioners' workload of adding nurse practitioners to the general practice team.

Design Randomised controlled trial with measurements before and after the introduction of nurse practitioners.

Setting 34 general practices in a southern region of the Netherlands.

Participants 48 general practitioners.

Intervention Five nurses were randomly allocated to general practitioners to undertake specific elements of care according to agreed guidelines. The control group received no nurse.

Main outcome measures Objective workload, derived from 28 day diaries, included the number of contacts per day for each of three conditions (chronic obstructive pulmonary disease or asthma, dementia, cancer), by type of consultation (in practice, telephone, home visit), and by time of day (surgery hours, out of hours). Subjective workload was measured by using a validated questionnaire. Outcomes were measured six months before and 18 months after the intervention.

Results The number of contacts during surgery hours increased in the intervention group compared with the control group ($P < 0.06$), particularly for patients with chronic obstructive pulmonary disease or asthma ($P < 0.01$). The number of consultations out of hours declined slightly in the intervention group compared with the control group, but this difference did not reach significance. No significant changes became apparent in subjective workload.

Conclusion Adding nurse practitioners to general practice teams did not reduce the workload of general practitioners, at least in the short term. This implies that nurse practitioners are used as supplements, rather than substitutes, for care given by general practitioners.

Introduction

Expansion in the workload of general practitioners has led many countries to shift care to other health professionals, notably nurses.^{1 2} Nurses can undertake health promotion work^{3 4} and routine management of chronic diseases such as asthma, diabetes, and

coronary heart disease.⁵⁻⁷ A systematic review has shown that nurses can achieve health outcomes that are as good as those of general practitioners and that they may have superior interpersonal skills.⁸ It is unclear, however, whether nurses reduce the workload of general practitioners. Nurses may supplement or extend general practitioner care rather than substitute for it.

We measured the impact of adding a nurse practitioner to the general practice team on general practitioners' workload. We anticipated that measures of objective workload, such as consultation rates, would decline if nurse practitioners were used as substitutes for doctors. No such reductions were expected if nurse practitioners were used to supplement or extend general practitioner care. In either case general practitioners might report improvements in subjective aspects of workload, such as job satisfaction and work stress.

Participants and methods

Design

We conducted a randomised controlled trial of the impact on general practitioners' workload of adding nurse practitioners to the practice team. In the Netherlands general practitioners are organised into "local groups," and regional policy states that each should ideally have one full time nurse practitioner. The local association of general practitioners approached the 21 local groups (167 general practitioners) in a southern region of the Netherlands, and seven of these volunteered to participate (figure). We grouped local groups into matched pairs, using deprivation of the population and rural or urban location of the practices as the matching criteria. We assigned the odd local group to one pair, creating a matched threesome. After baseline measurement, one local group from each pair and two local groups from the threesome were randomly assigned to the intervention. The other local groups were assigned to the control group.

Intervention

The recruited nurse practitioners were experienced community nurses. On average one full time nurse

Centre for Quality of Care Research (WOK), University Medical Centre Nijmegen, PO Box 9101, 6500 HB Nijmegen, Netherlands
Miranda G H Laurant
health scientist
Rosella P M G Hermens
epidemiologist
Jozé C C Braspenning
research psychologist
Richard P T M Grol
professor in quality of care

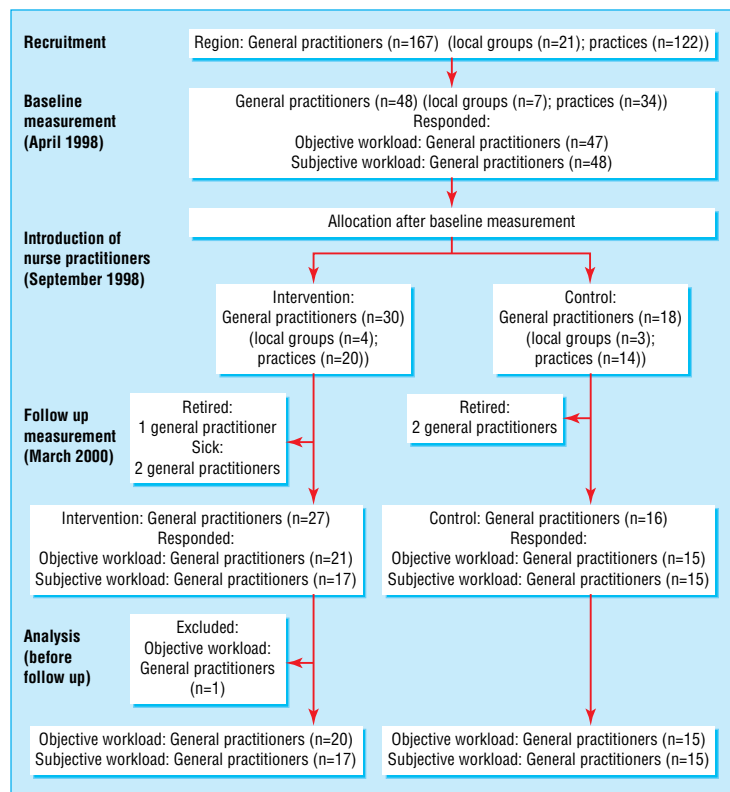
National Primary Care Research and Development Centre (NPCRDC), University of Manchester, Manchester M13 9PL
Bonnie Sibbald
professor of health services research

Correspondence to: M G H Laurant
m.laurant@wok.umcn.nl

BMJ 2004;328:927-30



This is the abridged version of an article that was posted on bmj.com on 6 April 2004: <http://bmj.com/cgi/doi/10.1136/bmj.38041.493519.EE>



Flow of participating general practitioners through trial

worked for seven full time doctors, according to agreed guidelines (box).

Measures

We measured objective and subjective workload of participating doctors six months before and 18 months after nurse practitioners were introduced. We also recorded demographic and practice characteristics of doctors.

We measured objective workload by diary. For 28 consecutive days, including evenings and weekends, general practitioners recorded the time they started and finished the working day and, for patients with chronic obstructive pulmonary disease or asthma, dementia, and cancer separately, the number of consultations in the practice, of telephone consultations, and of home visits. This method is widely used and has proved to be valid in previous studies.^{10 11} Reporting bias is likely to have been similar for both intervention and control groups.

We used a questionnaire with proved validity and reliability to measure subjective workload¹²; satisfaction with the availability of time for practice management; job satisfaction; level of inappropriate demand by patients; and perceived discrepancy between investment and reward (cost benefit).

Analysis

From our power calculation we needed to recruit at least 30 general practitioners. For each doctor in each observation period we calculated the total number of different contacts per week as recorded in their diaries; the number of hours worked per day; and the number of evenings, nights, and weekends on call. We standardised each measure to account for differences between

general practitioners in actual hours worked during the day or on call over the study period.

We transformed questionnaire items measuring subjective workload to ensure that a higher score represented a higher perceived workload. We computed average scores for each doctor.

We assessed the significance of differences between the intervention and control groups.

Results

Study population

The intervention and control groups were comparable with regard to general practitioners' demographic and practice characteristics at baseline (see bmj.com). Participating general practitioners resembled non-participants in the region with regard to sex and type of practice. The study group as a whole resembled general practitioners nationally in terms of age, sex, and characteristics of the practice.

Thirty five (73%) of the 48 doctors who completed baseline and follow up diaries, and thirty two (67%) who completed baseline and follow up questionnaires, were included in the analysis (figure).

Nurse practitioners: a job description

Target population

- Patients with chronic obstructive pulmonary disease, asthma, dementia, or cancer.

Tasks performed according to agreed guidelines (developed for this study)

- Performing diagnostic tests
- Assessing patients' health and home situation
- Educating patients and family
- Performing (preventive) social visits to patients
- Coordinating the care of patients and making contact with community health services, specialised nurses, etc

Procedure

- Patient referred by general practitioner to nurse practitioner
- Nurse practitioner makes one of four decisions according to agreed guidelines: nurse takes care of patient; nurse and general practitioner share care; patient referred back to general practitioner; or patient does not need care
- The nurse practitioner had access to the (electronic) medical records and reported contacts with patients in them. If necessary, the nurse discussed the patient and course of action with the general practitioner

Training

- Registered nurse with BSc degree who had worked at least two years as a community nurse
- Nurses followed a special training programme for two weeks before introduction to the general practice

Definition of a nurse practitioner

- Nurses with additional knowledge, skills, and attitudes who take responsibility for the assessment and treatment of patients in primary care,⁹ working with, rather than for, a general practitioner, as co-practitioners and collaborative members of the general practice team

Table 1 Objective workload of general practitioners, expressed as the mean number of contacts with patients per week (95% confidence intervals) per group of patients during surgery hours (standardised by median number of days worked) and out of hours (standardised by mean number of shifts) before and after the introduction of the nurse practitioner

Patient contacts	Intervention group (n=20)			Control group (n=15)			P value†‡
	Before	After	Δ*	Before	After	Δ*	
Surgery hours	12.9 (9.0 to 16.8)	17.4 (12.4 to 22.4)	+4.5 (0.6 to 8.3)	10.3 (7.6 to 13.0)	10.4 (7.0 to 13.9)	+0.1 (-1.9 to 2.2)	0.057†
Chronic obstructive pulmonary disease or asthma	6.6 (4.1 to 9.2)	9.5 (6.0 to 12.9)	+2.8 (0.3 to 5.3)	5.4 (3.6 to 7.3)	5.2 (3.2 to 7.3)	-0.2 (-1.4 to 1.1)	0.006†
Dementia	2.5 (1.4 to 3.5)	3.4 (2.0 to 4.9)	+0.9 (-0.2 to 2.1)	2.1 (1.4 to 2.7)	2.6 (1.2 to 4.0)	+0.5 (-0.8 to 1.9)	0.548‡
Cancer	3.8 (2.5 to 5.1)	4.5 (3.3 to 5.7)	+0.7 (-0.7 to 2.2)	2.8 (1.9 to 3.7)	2.6 (1.4 to 3.8)	-0.2 (-1.4 to 1.0)	0.059‡
Out of hours	4.8 (2.1 to 7.5)	3.3 (1.9 to 4.7)	-1.5 (-3.9 to 0.9)	3.7 (0.8 to 6.6)	5.8 (0.6 to 11.0)	+2.1 (-1.3 to 5.5)	0.217†
Chronic obstructive pulmonary disease or asthma	2.8 (1.2 to 4.4)	1.3 (0.5 to 2.0)	-1.5 (-3.0 to -0.03)	1.6 (-0.09 to 3.3)	2.3 (-0.09 to 4.6)	+0.7 (-0.9 to 2.2)	0.094†
Dementia	0.7 (-0.004 to 1.5)	0.3 (0.06 to 0.5)	-0.5 (-1.3 to 0.3)	0.5 (0.1 to 0.9)	0.9 (0.05 to 1.7)	+0.4 (-0.4 to 1.1)	0.172†
Cancer	1.2 (0.4 to 2.1)	1.8 (0.7 to 2.8)	+0.5 (-0.5 to 1.5)	1.6 (0.3 to 2.8)	2.6 (0.4 to 4.9)	+1.1 (-0.5 to 2.6)	0.673†

*Change over time in intervention and control groups (effect size).

†Mann-Whitney U test.

‡Analysis of covariance.

Objective workload

We found no significant differences at baseline between doctors who completed diaries at follow up (n = 35) and those who did not (n = 12) in their mean number of contacts during surgery hours (z = -0.90, P = 0.367) or out of hours (z = -1.50, P = 0.135).

The number of contacts during surgery hours increased by 4.5 per week over the study period in the intervention group but did not change in the control group (table 1). The increase was not significant. The excess of contacts in the intervention group was due to an increase in the number of contacts with patients who had chronic obstructive pulmonary disease or asthma.

The number of contacts out of hours decreased by 1.5 in the intervention group and increased by 2.1 in the control group (table 1). The decline in the intervention group was non-significant.

At baseline and follow up most patients with chronic obstructive pulmonary disease or asthma attended the practice, whereas most patients with dementia and cancer received home visits. As the intervention group had more contacts for chronic obstructive pulmonary disease or asthma, they additionally experienced a greater increase in the number of practice based consultations than the control group (z = -3.0, P = 0.003). Other types of consultations (telephone or home visits) did not change significantly (see bmj.com).

Subjective workload

Table 2 summarises the mean scores for each of the four aspects of subjective workload. We found no significant differences in questionnaire responses at baseline between doctors who completed the follow up (n = 32) and those who did not (n = 16). The change in subjective workload measures from baseline to follow

up did not differ significantly between intervention and control groups.

Discussion

The introduction of nurse practitioners did not reduce the workload of the general practitioners. Measures of objective workload increased, at least in the short term. The number of contacts with general practitioners for chronic obstructive pulmonary disease or asthma during surgery hours may have increased because nurse practitioners discovered unrecognised problems that demanded doctors' attention. This may diminish with time once the backlog of problems is dealt with. Doctors and nurses may also require time to develop the trust needed to facilitate delegation of tasks. Longer term studies will be needed to establish whether workload is reduced beyond 18 months.

Possible benefit of introducing nurse practitioners

The increase in surgery contacts was partially offset by a small (non-significant) reduction in the number of contacts during evenings and weekends. It is possible that nurse practitioners improved the quality of care for patients during surgery hours, thus preventing calls out of hours. Further research is needed to evaluate this potential benefit.

Doctors' subjective workload

General practitioners reported no subjective benefits in terms of workload. This might be because general practitioners were already satisfied with three of the four aspects of work we investigated. The fourth aspect—inappropriate demands from patients—was not readily susceptible to change as the general practitioner is the first point of contact for all patients and nurse practitioners assisted in the care of only

Table 2 Subjective workload expressed as a mean score (95% confidence interval) on a five point scale*, before and after the introduction of nurse practitioners

Scored variable	Intervention group (n=17)		Control group (n=15)		F _{3, 28} †	P value†
	Before	After	Before	After		
Available time	2.7 (2.3 to 3.0)	2.8 (2.5 to 3.2)	2.9 (2.6 to 3.2)	2.8 (2.4 to 3.2)	1.19	0.285
Job satisfaction	2.2 (1.8 to 2.5)	2.2 (1.9 to 2.4)	2.3 (1.9 to 2.8)	2.4 (2.1 to 2.7)	0.68	0.415
Inappropriate demands	3.4 (3.1 to 3.7)	3.5 (3.1 to 3.8)	3.4 (3.1 to 3.7)	3.5 (3.1 to 3.8)	0.27	0.608
Cost benefit	2.9 (2.5 to 3.3)	3.0 (2.7 to 3.3)	2.8 (2.3 to 3.2)	2.8 (2.5 to 3.2)	0.51	0.479

*Higher score represents higher job stress.

†Analysis of covariance.

What is already known on this topic

In many Western countries nurses undertake most of the health promotion work provided in general practice, and they also have an important role in the routine management of chronic diseases

Nurse practitioners can achieve health outcomes that are as good as those of general practitioners, and patients are satisfied with the care provided by nurse practitioners

What this study adds

Nurse practitioners do not reduce the general practitioners' workload, which can be explained by the type of tasks nurse practitioners perform

Nurses are not substitutes for doctors but provide a wider range of services than was available previously

Although general practitioners were enthusiastic about the nurse practitioners, adding nurse practitioners to the general practice team did not influence the subjective workload (such as job satisfaction and work stress) experienced by general practitioners

three groups of patients. Interviews with general practitioners in the intervention group indicated, however, that doctors believed that nurses had lightened their burden of care for patients in the targeted groups.

Limitations of the study

The study was performed in only one region of the Netherlands, which may limit the generalisability of the findings. Several general practitioners were lost to follow up, which threatens the internal validity of the trial. Although not reaching significance, measures of objective workload were slightly higher among the general practitioners who withdrew. The dropout rate was higher in the intervention group and may reflect uncertainty at that time about whether government policy would continue to support the employment of nurse practitioners.

Conflicting evidence

Some researchers have noted that nurses reduce general practitioners' workload.^{5 13-16} Others have found no effect.¹⁷⁻¹⁹ Differences in the effect might be explained by differences in nurses' degree of autonomy, level of training, and the conditions that they are asked to manage, or variation in the ratio of nurses to doctors.

Our findings are consistent with the view that nurses are often used as supplements, not substitutes, for general practitioner care. Gains for the efficiency of services can be achieved only if general practitioners give up providing the types of care they have delegated to nurses and instead invest their time in activities that only doctors can perform.²⁰

We thank all general practitioners who participated in the study. We also thank Reinier Akkermans, statistician at the University Medical Centre Nijmegen, for his statistical advice.

Contributors: See bmj.com

Funding: Local Association of General Practitioners (DHV Midden Brabant), Local Community Nursing Authorities (Thebe thuiszorg), and two local insurance companies (CZ Actief in Gezondheid, VGZ Midden Brabant).

Competing interests: None declared.

- Jenkins-Clarke S, Carr-Hill R, Dixon P. Teams and seams: skill mix in primary care. *J Adv Nurs* 1998;28:1120-6.
- Whitcross L. Collaboration between GPs and nurse practitioners. The overseas experience and lessons for Australia. *Aust Fam Physician* 1999;28:349-53.
- Family Heart Study Group. Randomised controlled trial evaluating cardiovascular screening and intervention in general practice: principal results of British Family Heart Study. *BMJ* 1994;308:313-20.
- Muir J, Lancaster T, Jones L, Yudkin P, for the OXCHECK Study Group. Effectiveness of health checks conducted by nurses in primary care: final results of the OXCHECK study. *BMJ* 1995;310:1099-104.
- Charlton I, Charlton G, Broomfield J, Mullee MA. Audit of the effect of a nurse run asthma clinic on workload and patients' morbidity in general practice. *Br J Gen Pract* 1991;41:227-31.
- Kirkman MS, Weinberger M, Landsman PS, Sams GP, Shortliffe EA, Simel DL, et al. A telephone-delivered intervention for patients with NIDDM. *Diabetes Care* 1994;17:840-6.
- Aubert RE, Herman WH, Waters J, Moore W, Sutton D, Peterson BL, et al. Nurse case management to improve glycaemic control in diabetic patients in a health maintenance organization. *Ann Internal Med* 1998;129:605-12.
- Horrocks S, Anderson E, Salisbury C. Systematic review of whether nurse practitioners working in primary care can provide equal care to doctors. *BMJ* 2002;324:819-23.
- Bliss A, Cohen E, eds. *The new health professionals*. Rockville, MD: Aspen Systems Cooperation, 1977.
- Rethans JJ, Westin S, Hays R. Methods for quality assessment in general practice. *Fam Pract* 1996;13:468-76.
- Hutten JBF. Workload and provision of care in general practice. [Dissertation.] Utrecht, 1998.
- Van Dierendonck D, Groenewegen PP, Sixma H. *Opgebrand, een inventariserend onderzoek naar gevoelens van motivatie en demotivatie bij huisartsen [Burn-out. A study of feelings of motivation and de-motivation of general practitioners]*. Utrecht: Nivel, 1992.
- Marsh GN, Dawes ML. Establishing a minor illness nurse in a busy general practice. *BMJ* 1995;310:778-80.
- Fall M, Walter S, Read S, Deverill M, Lutman M, Milner Ph, et al. An evaluation of a nurse-led ear care service in primary care: benefits and costs. *Br J Gen Pract* 1997;47:699-703.
- Bruce J, Watson MS, Watson D, Palin AN, Lawton K. Workload implications of community psychiatric nurse employment by a general practice: a pilot study. *Br J Gen Pract* 1998;48:1419-20.
- Latimer V, George S, Thompson F, Thomas E, Mullee M, Turnbull J, et al. (SWOOP Group). Safety and effectiveness of nurse telephone consultation in out of hours primary care: randomised controlled trial. *BMJ* 1998;317:1054-9.
- Salisbury CJ, Tattersell MJ. Comparison of the work of a nurse practitioner with that of a general practitioner. *J Roy Coll Gen Pract* 1988;38:314-6.
- Touche Ross. *Evaluation of nurse practitioner pilot projects*. London: Touche Ross, 1994.
- Campbell N, Thain J, Deans H, Ritchie L, Rawles J, Squair J. Secondary prevention clinics for coronary heart diseases: randomised trial of effect on health. *BMJ* 1998;316:1434-7.
- Richardson MSC. Identifying, evaluating and implementing cost-effective skill mix. *J Nurse Manag* 1999;5:265-70.

(Accepted 20 February 2004)

doi 10.1136/bmj.38041.493519.EE

Endpiece

A physician's tooth as an infallible amulet

When Nubians ambushed Mohammed Ali's son, Ismayl Pasha, they spared his Greek physician and "drew out all his teeth, which they divided amongst themselves to sew up in their *grigri* [amulets] bags, it being their firm belief whosoever carries about him the tooth of a physician (drawn whilst *living*) secures himself from all diseases for all time to come."

King CW. *Early Christian Numismatics and other Antiquarian Tracts*. London: Bell and Daldy, 1873:202

Jeremy Hugh Baron,
honorary professorial lecturer,
Mount Sinai School of Medicine, New York