The Lancet 8-14 July 2006, 368 (9530) : 130-138. DOI:10.1016/S01406736(06)68812-0

Specialist Outreach to Isolated and Disadvantaged Communities: A Population-Based Study

Russell L. Gruen [a, b], Ross S Bailie [a, b], Zhiqiang Wang [c], Sam Heard[d] and Ian C. O'Rourke [b, e]

[a]*Menzies School of Health Research, Institute of Advanced Studies, Charles Darwin University, Casuarina, NT, Australia*
[b]*Flinders University Northern Territory Clinical School, Casuarina, NT, Australia*
[c]*Centre for Chronic Disease, School of Medicine, University of Queensland, Herston, QLD, Australia*
[d]*Health Informatics, Central Queensland University, Rockhampton, QLD, Australia*
[e]*Royal Darwin Hospital, Casuarina, NT, Australia*

Abstract

Background

Visiting-specialist clinics (specialist outreach) have the potential to overcome some of the substantial access barriers faced by disadvantaged rural, remote, and Indigenous communities, but the effectiveness of outreach clinics has not been assessed outside urban and non-disadvantaged settings. We aimed to assess the effects of outreach clinics on access, referral patterns, and care outcomes in remote communities in Australia.

Methods

We undertook a population-based observational study of regular surgical, ophthalmological, gynaecological, and ear, nose, and throat outreach visits, compared with hospital clinics alone, on access, referral practices, and outcomes for the populations of three remote Indigenous communities in northern Australia for 11 years. We assessed all new non-emergency potential specialist surgical cases who presented initially between Jan 1, 1990, and Jan 1, 2001. The effects of outreach clinics on the proportion of patients referred, the time from referral to initial specialist consultation, and the rates of community-based and hospital-based procedures were analysed using logic regression and Cox proportional hazard models.

Findings

2339 new surgical problems presented in 2368 people between 1990 and 2001. Outreach improved the rate of referral completion (adjusted hazard ratio 1.41, 95% CI 1.07-1.86) and the risk of timely completion according to the urgency of referral (adjusted relative risk 1.30, 1.05-1.53). Outreach had no significant effect on initiation of elective referrals, but there were 156 opportunistic presentations on outreach clinic days. Specialist investigations and procedures in community clinics removed the need for many patients to travel to hospital, and outreach consultations were associated with a reduced rate of procedures that needed hospital admission (adjusted hazard ratio 0.67, 0.43-.03).

Interpretation

Specialist outreach visits to remote disadvantaged Indigenous communities in Australia improve access to specialist consultations and procedures without increasing elective referrals or demands for hospital inpatient services.

Introduction

About half the world's people live outside major urban centres where health services, and specialist medical services in particular, are concentrated.[1] Many rural, remote, and Indigenous populations have greater overall health needs than urban populations[2] but face substantial difficulties obtaining specialist care.

Visiting-specialist services, otherwise known as specialist outreach, are one strategy for improving access to specialists. A systematic review of specialist outreach clinics in primary care and rural hospital settings noted published reports of 73 initiatives in 14 countries on five continents.[3] Almost all high-quality comparative studies, however, were from urban settings. Virtually no evidence was recorded about the effectiveness of specialist outreach to remote disadvantaged populations where there is, potentially, the most to gain, but for which substantial resources are also needed.

In 1997, the Australian Government funded a multidisciplinary Specialist Outreach Service (SOS) to remote Indigenous communities in the Northern Territory, an area of over 1.3 million square kilometres stretching from the tropical north to the central desert. Proportionally, the Northern Territory has the highest Indigenous population of any Australian jurisdiction. 89% of these Indigenous people live in small and widely dispersed communities, three-quarters of which are more than 250 (and up to 1000) kilometres by road from tertiary medical services (figure 1).[4]

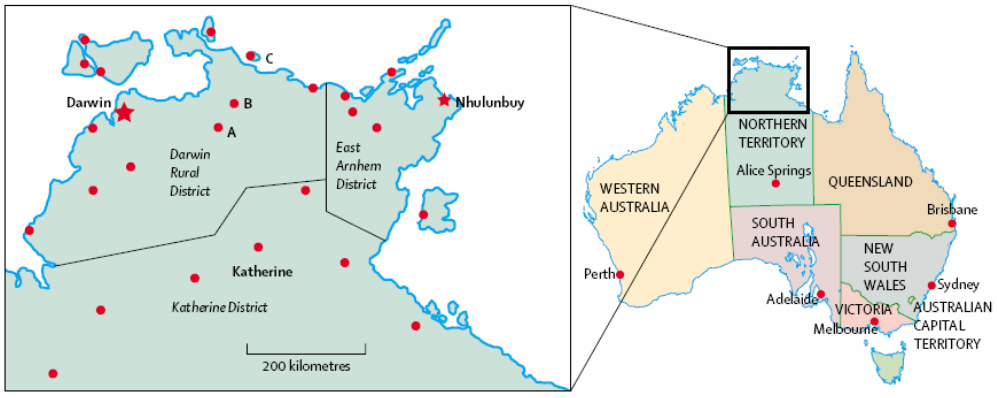

Figure 1. The large Indigenous communities in the top end of the Northern Territory. Communities taking part in this study are marked A, B, and C.

The population of remote Indigenous communities is young and mobile, and incorporates a mixture of traditional and modern cultures. Most remote Indigenous communities have an elected community government council and basic facilities such as a store, a school, a police station, and a health clinic staffed by Indigenous health workers and community nurses. Housing is frequently overcrowded and in disrepair.[4] Indigenous people in remote communities have a disproportionately high burden of chronic and infectious diseases, malignant diseases, and injuries, and their median life expectancy is almost 20 years less than that of other Australians. Despite their poor health, people in remote Indigenous communities use substantially fewer general and specialist medical services than do non-Indigenous people.[5]

In medical emergencies, fixed-wing aerial medical services retrieve patients to hospital. In non-emergency situations patients in need of specialist care are referred to an outpatient clinic in a public hospital. Minor surgical procedures are beyond the capacity of most primary health-care services in remote areas, as are many diagnostic tests for conditions that are common in this population, such as colposcopy for cervical dysplasia and fundoscopy

for cataract or diabetic retinopathy. Although the Australian Government subsidises travel expenses for people accessing specialist care electively through hospital outpatient clinics, barriers created by distance, inaccessible roads, lack of public transport, poor communication, cultural differences, and unfamiliar hospital processes can be almost insurmountable.[6] A simple 15-minute appointment could mean a 3-day trip, multiple modes of public transport, overnight accommodation at crowded urban hostels, and dislocation from family and usual supports.[7] Non-attendance rates of up to 40% at hospital outpatient and operating theatre appointments suggest that many remote-community patients fail to receive specialist care when requested.[8]

The SOS was an initiative with specialists at Royal Darwin Hospital, and was supported by most local community government councils and primary health-care workers. Building on the experiences of a small number of visiting physicians and paediatricians, the SOS provided general surgery, gynaecology, ophthalmology, and ear, nose, and throat visits to ten remote communities. Visit schedules were negotiated with local clinic staff, and consultants in each discipline visited each community between one and four times per year by small aircraft or four-wheel drive vehicle. New and follow-up patients were seen. An ophthalmologist used a portable slit-lamp for eye examinations, a gynaecologist brought a portable colposcope and an obstetric ultrasound, and general surgeons had a range of equipment for minor procedures such as sigmoidoscopy, skin and breast biopsies, circumcisions, and vasectomies. When more complex procedures were indicated, arrangements were made for a hospital visit in Darwin.

Our assessment of the early experience of the SOS[6] showed an increase in the number of specialist consultations with remote community patients of up to 400%, and a decrease in consultations in the outpatient clinics of regional hospitals. We showed that outreach visits cost less per consultation than outpatient clinics, although the increased patient throughput needed additional overall investment. Patients and remote-community practitioners appreciated the familiar local clinic environment, having family in attendance, improved communication with specialists, and circumventing travel-related difficulties.

However, whether increased throughput and satisfaction translated into more appropriate use of specialists and improved care was unclear. We therefore undertook a population-based study to assess the effects of outreach clinics on access, referral patterns, and care outcomes. We postulated that outreach visits would improve access, which in turn would increase the rate of specialist referrals and reduce non-attendance. We also postulated that outreach would lead to on-site procedures and increased attendance rates at hospital operating theatres because of improved rapport, better care coordination, and establishment of trust.

Methods

The study focused on three communities ranging from 260 to 500 km from Darwin (figure 1). The three communities were deliberately selected as being broadly representative of the communities served by the SOS, and because common language ties and intercommunity migration between them might improve follow-up.[9] (see online for web figures). Community A had an Indigenous population and a larger non-Indigenous population serving local mining and tourism industries. The community had year-round road access and public transport to the regional hospital. Community B consisted of predominantly Indigenous people, had no public transport, and was isolated by monsoonal floods from December to April every year, during which access was by small aircraft to an unsealed airstrip. Community C was an island community almost exclusively of Indigenous people, and for access needed chartered aircraft.

The only health care facility in the three communities was a government-operated clinic staffed by nurses and Indigenous health workers, with resident primary-care doctors located in community A since the 1980s and community B since 1996. A primary-care doctor visited community C fortnightly. The region was served by one public hospital with a range

of specialist medical and surgical services, and one private hospital, although very few Indigenous people had private health insurance.

We studied the effects of visiting specialists in general surgery, ophthalmology, gynaecology, and ear, nose, and throat surgery. The intensity of specialist outreach visits in each specialty to each community was graded according to visit frequency: none (no visits within 1 year); low (more than 6 months between visits); medium (3–6 months between visits; and high (3 months or less between visits; figure 2).

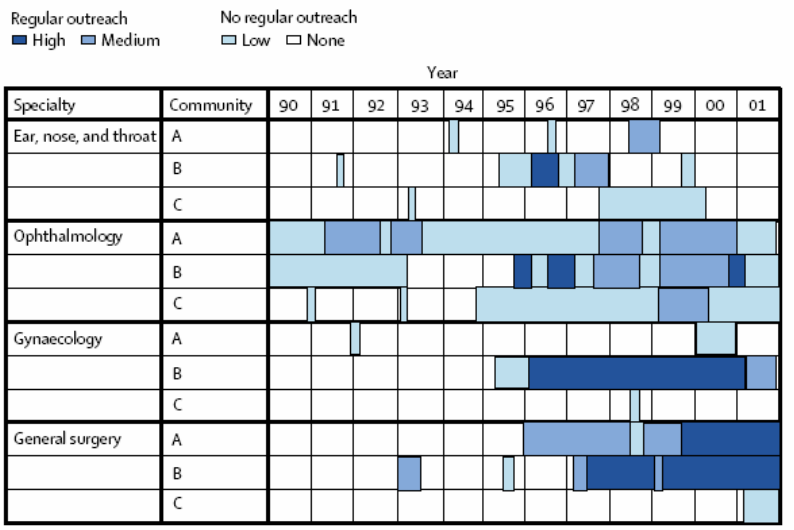

Figure 2. Intensity of outreach to the study communities

A census of community medical records of living and deceased Indigenous individuals in each community was done. Non-Indigenous people in the three communities, almost all of whom had short-term contracts with government, community services, or local industries, were excluded from the study because most had special employment-based arrangements for health care. Identification of Indigenous people was facilitated by the separate filing systems for records of Indigenous and non-Indigenous clients of these services and confirmed with local community staff when necessary.

We included all new non-emergency potential specialist surgical cases, as we have previously defined, [10, 11] who presented initially between Jan 1, 1990, and Jan 1, 2001. Most urological, vascular, plastic, thoracic, and neurosurgical problems were managed by general surgeons during this period and were included as such. Orthopaedic problems were excluded because there was no orthopaedic outreach. For all cases, the dates of initial presentation and first referral, if applicable, were extracted from the community medical record. The maximum severity was estimated with the Dukes severity of illness (DUSOI) score. [12]

Patients could have planned referrals to either hospital outpatient clinics or outreach clinics. Some patients presented opportunistically to outreach clinics without being referred and, for analytical purposes, were regarded as being referred on the day of the specialist visit, with the referral being unplanned. We established the main reason for each referral as classified by Coulter[13] (for diagnosis, treatment, a specific investigation, management advice, or to take over management). The urgency of each referral was classified according to the categories of the Australian National Health Data Dictionary: urgent (potential to deteriorate quickly and become an emergency); semi-urgent (some pain, dysfunction, or disability, but not likely to deteriorate quickly or become an emergency); or non-urgent (little or no pain, dysfunction, or disability, and unlikely to deteriorate quickly or become an emergency). [14] For each category, we set the maximum acceptable delay between referral and specialist consultation to be half the nationally-adopted maximum time that patients should wait for elective procedures in Australian hospitals.[14] By this allocation, we established that so-called

timely completion of referrals needed urgent referrals to be completed within 15 days, semi-urgent within 45 days, and non-urgent referrals within 6 months.

Completion rates of referrals were used as indicators of access. We examined, in addition to the community medical record, the regional hospital medical record, the SOS database, and administrative travel, emergency department, and outpatient databases to determine whether or not the referral was completed and, if so, when and where the specialist consultation took place. Specialist consultations up to Jan 1, 2002, were included. Known and consistent patient identifiers were used to link datasets in a process that was validated and shown to be accurate in a sample of 200 paper-based hospital medical records.

To assess outcomes, we identified outcome indicator conditions that were common elective referrals in the study population, had reliable or absolute recorded measures of severity and outcome, and had a clear, preferably guideline-based, role for specialists. Conditions meeting these criteria fell into three groups: those needing specialist diagnostic procedures (colposcopy for abnormal pap smears, and fundoscopy for diabetics and others at risk of retinopathy); those able to be fully treated in an outreach clinic (minor skin procedures, vasectomies, and circumcisions in patients older than 5 years); and those needing a hospital visit for treatment (treatment of high-grade cervical lesions, cataract, tests for infertility, female surgical sterilisation, circumcisions in boys younger than 5 years, and more complex general surgical procedures such as cholecystectomy, hernias, breast biopsies, thyroidectomy, and difficult skin lesions). For the outcome indicator conditions we extracted details of dates when bookings were made for operations and where and when they were subsequently done. Outcomes of interest were obtaining specialist diagnostic procedures, having operative management in a clinic or in hospital, and the occurrence of clinically important complications.

We also gathered details of covariates thought to affect referral, access, and clinical outcomes, including the patient's age, sex, and private insurance status, the availability of a primary care doctor, and road access to the community. All data extraction was undertaken by four trained individuals using a specially-designed relational database and entry was standardised with look-up tables and the International Classification of Primary Care Version 2-Plus.[15, 16]

The study and its design were informed by preliminary qualitative research involving community members and clinic staff. Conduct of the study and interpretation of the data was facilitated by community-based Indigenous health workers and nurses. Approval for the study was granted separately by all three community government councils after presentation of, deliberation over, and adjustments to the protocol. Research ethics approval was granted by the Joint Institutional Ethics Committee of the Royal Darwin Hospital and Menzies School of Health Research. The institutional ethics committee, the community government councils, and the local clinic staff approved access to patients' records, and analysis and reporting of de-identified data without requiring that consent be obtained from every member of the population.

Statistical analysis

Characteristics of referrals and patients seen were compared with χ^2 analysis. Rates of referral, completion of referrals, and procedures were compared for periods of medium-high intensity outreach (known as regular outreach available) and none-low intensity outreach (no regular outreach available). The Kaplan-Meier method was used to construct unadjusted curves of time to event. The Cox proportional hazards model was used to calculate unadjusted and adjusted hazard ratios, provided the proportional hazards assumption was valid. Outreach availability was included as a time-varying variable because regular outreach could change from being available to being unavailable, or vice versa, between a patient's referral and their initial specialist consultation. In such cases this period was split into separate time-spans, thereby allowing outreach availability to assume different values over time within a single referral episode.[17] Relative risks of timely specialist referral were transformed from odds

ratios calculated with logistic regression analysis.[18] Regular outreach availability at the time of referral was the independent variable of interest. Risk differences of timely specialist consultation with and without regular outreach were calculated and plotted with binomial regression.

All analyses were done with STATA version 8.[19] Age and severity of illness were not normally distributed and were included as categorical variables. Age was classified into purposive categories for children (younger than 15 years), young adults (15–44 years), and older adults (45 years or older). Severity of illness was classified into screening or prevention without active illness (DUSOI 0), and the remainder into groups of roughly equal size (DUSOI 1–5 and DUSOI 6–15). An extra linear time variable that increased in value by one every year from 1 in 1990 to 12 in 2001 was included to allow for progressive changes in health service activity not accounted for by other independent variables. All CIs and tests of significance were based on the standard error adjusted with the robust variance estimator method to account for population clustering by community.

Role of the funding source

The sponsors of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all data in the study and had final responsibility for the decision to submit for publication.

TABLE 1. Problems and referrals

	Problems (n)	Referrals (n)	Referrals as percentage of problems			
			Total	Emergency	Elective	Opportunistic
Sex						
Female	1252	917	73.2%	24.3%	41.7%	7.2%
Male	1087	711	65.5%	33.9%	26.6%	5.0%
Age group (years)						
0–14	573	378	66.0%	34.6%	24.6%	6.8%
15–44	1307	913	69.9%	26.7%	38.9%	4.3%
>45	459	337	73.4%	27.2%	5.5%	10.7%
Community						
A	734	442	60.2%	23.8%	33.0%	3.4%
B	1346	972	72.2%	30.5%	34.8%	6.9%
C	259	214	82.6%	33.2%	39.4%	10.0%
Specialty						
General surgery	803	504	62.8%	39.7%	22.7%	0.4%
Orthopaedics*	461	280	60.7%	43.4%	16.9%	0.4%
Ophthalmology	288	230	79.9%	6.9%	44.8%	28.1%
Gynaecology	276	250	90.6%	4.7%	79.7%	6.2%
Ear, nose, and throat	246	151	61.4%	18.3%	30.9%	12.2%
Urology†	175	146	83.4%	12.6%	64.6%	6.3%
Other†	90	67	74.4%	58.9%	15.6%	0.0%
Overall	2339	1628	69.6%	28.7%	34.7%	6.2%

* Orthopaedics omitted from further analysis due to no outreach.
† Urology and Other included with General surgery in subsequent analysis.

Results

2368 Indigenous people had 15 403 person-years of entries in community medical records in the three community clinics during the study period. Women accounted for 49·3% of the population and 51·5% of person-years of medical record entries. Median age of patients at

June 30, 1996, was 19, which is close to Government census-based estimates of the Indigenous population of the Northern Territory.[20]

1269 people (53%) had at least one, and as many as 11, surgical problems incident during the study period. 2339 new surgical problems were seen (table 1). Excluding 461 orthopaedic problems, 1878 problems remained, of which 472 (25%) resulted in emergency evacuation to hospital. There were 1406 non-emergency problems, including 503 (27%) that resulted in elective referral to hospital outpatient clinics, 231 (12%) that resulted in elective referral to outreach clinics, and 672 (36%) that did not result in any referral. Figure 3 shows the result of these referrals and non-referrals, including the 156 problems that were first seen on the day of a surgical clinic and were regarded as opportunistic referrals.

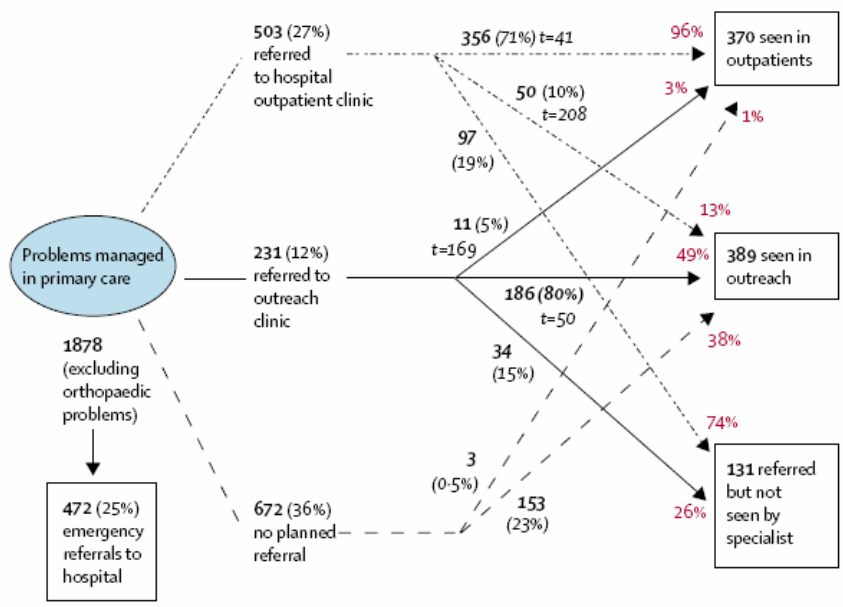

Figure 3. Intended destination, time delays, and outcomes of referred patients
Bold=number of problems. Italics %=percentage of problems referred to this destination. t=median time from referral to specialist consultation (days). Red=percentage of problems seen at this destination.

Of the 734 elective referrals, 90 (12%) were urgent, 323 (44%) were semi-urgent, and 321 (44%) were non-urgent. The most common categories of electively referred conditions are listed in webtable 1. (See online version for webtables 1 and 2.) Excluding emergency evacuations, specialists consulted on 759 (54%) problems within 12 months, 51% of which took place in outreach clinics.

596 (42%) people initially presented when regular outreach clinics in the relevant specialty were available in their community. The availability of regular outreach clinics was not associated with any significant overall increase in the proportion of people electively referred within 30 days of their initial presentation (40% [202 of 503] *vs* 37% [283 of 763], p=0·267 when opportunistic presentations were excluded). Overall, 293 patients were electively referred at a time when outreach was available, of whom 170 (58%) were referred to outreach clinics. These patients tended to have less severe and less urgent problems, and were more frequently females especially with gynaecological problems, than those referred to hospital clinics.

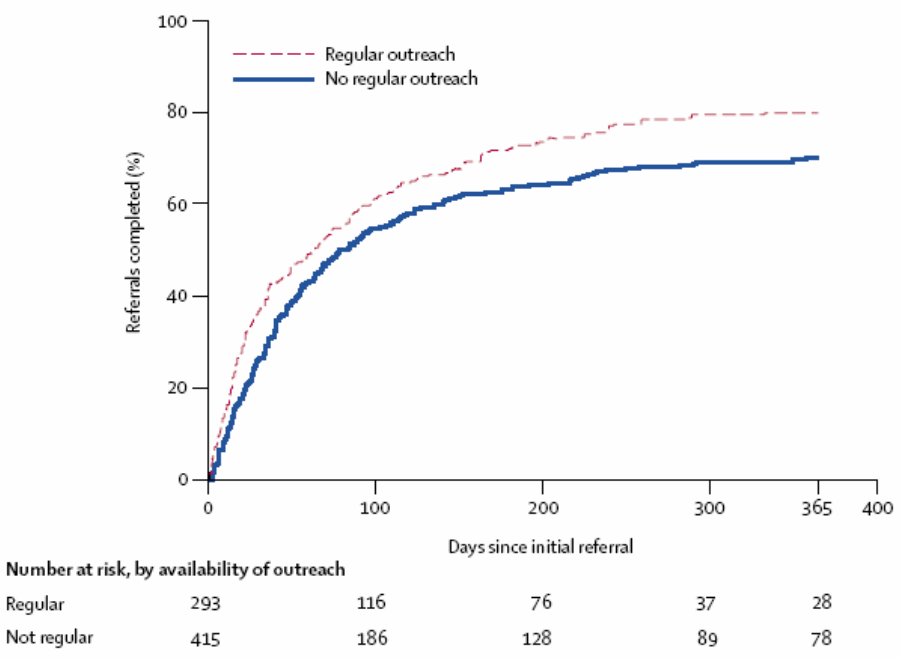

Figure 4. Time from elective referrals to initial specialist consultations, by regularity of outreach

The conditions leading to opportunistic presentations and unplanned referrals are listed in webtable 2. (See online version for webtables 1 and 2.) Compared with patients seen in hospital clinics, patients presenting opportunistically were significantly more likely to be younger than 15 or older than 44 years (42% [60 of 142] *vs* 35% [128 of 370], p<0·001), to have less severe (p<0·001) and less urgent problems (p<0·001), and be referred for specific investigations (73% [104 of 142] *vs* 41·4% [153 of 370], p<0·001).

Table 2. Timely completion of referrals according to outreach availability*

	Regular outreach available	No regular outreach available	Adjusted relative risk of regular outreach for timely completion of referrals* (95% CI)
By specialty			
Ear, nose, and throat	11/21 (52%)	24/52 (46%)	1.25 (0.66-1.76)
Ophthalmology	27/59 (46%)	12/61 (20%)	1.65 (0.92-2.60)
General surgery	74/134 (55%)	69/167 (41%)	1.34 (0.91-1.73)
Gynaecology	51/79 (65%)	76/135 (56%)	1.27 (1.20-1.34)
By community			
A	34/57 (60%)	64/145 (44%)	1.51 (1.03-1.87)
B	126/232 (54%)	82/190 (43%)	1.05 (0.69-1.44)
C	3/4 (75%)	35/80 (44%)	1.88 (0.42-2.26)
By urgency			
Urgent	19/35 (54%)	16/44 (36%)	0.97 (0.16-2.26)
Semi-urgent	60/123 (49%)	70/184 (38%)	1.41 (1.23-1.60)
Non-urgent	80/131 (61%)	93/185 (50%)	1.16 (0.94-1.36)
Overall			
	163/293 (56%)	181/415 (44%)	1.30 (1.05-1.53)

*Upper limit for acceptable time from referral to specialist consultation: urgent=15 days; semi-urgent=45 days; non-urgent=6 months.

Figure 4 shows that the proportion of electively referred problems that were seen by a specialist within 12 months increased from 70% (291 of 415) to 80% (234 of 293) when regular outreach clinics were available (log rank p=0·003, unadjusted hazard ratio 1·31 [95% CI 1·10–1·56]). The adjusted hazard ratio of specialist consultation was 1·41 (1·07–1·86). Similarly, availability of outreach clinics were associated with an increase from 44% (181 of 415) to 55·6% (163 of 293) of referrals being completed in a timely fashion commensurate with their urgency (p=0·002, unadjusted relative risk 1.28 [1·10–1·44]). The adjusted relative risk of timely specialist consultation was 1·30 (1·05–1·53; table 2), and the estimated absolute risk difference for timely specialist consultation was 11% (95% CI 2·2–20·3; figure 5). Table 3 shows the covariates in the time-to-event and logistic regression models.

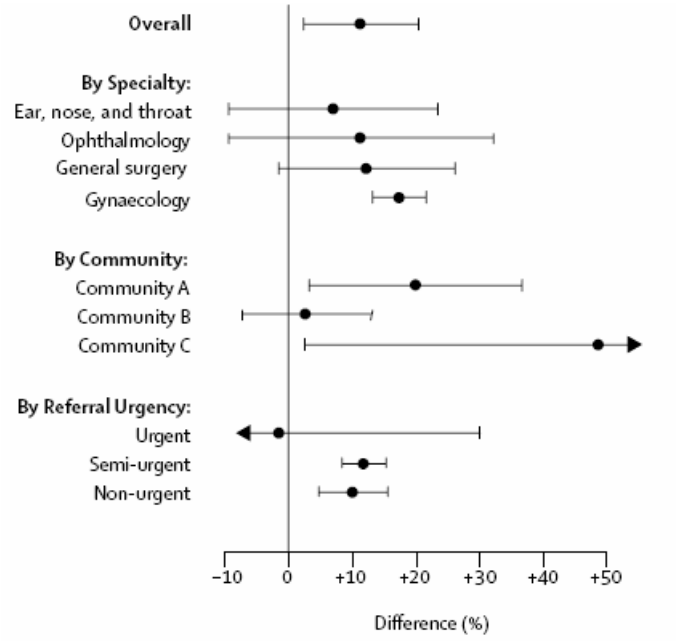

Figure 5. Adjusted risk difference of regular specialist outreach over no regular outreach on the timely completion of referrals.
Data are risk difference and 95% CI.

175 patients were referred for procedures that could be done in outreach clinics (23 colposcopy, 81 fundoscopy, and 52 circumcisions in children older than 5 years, 15 minor skin excisions, 4 vasectomies). 107 patients had their procedures done in a community clinic with no records of adverse outcomes. Most of these patients did not need to travel to Darwin at any stage of their treatment. 46 patients had procedures in a hospital outpatient clinic or day surgery facility, again without major complications. When regular outreach clinics were available the proportion of problems that were electively referred for specialist procedures and the proportion of those referred that eventually had the procedure were no different to when no regular outreach clinics were available (83% [74 of 89] *vs* 80% [101 of 126], p=0·507 and 86% [64 of 74] *vs* 84% [85 of 101], p=0·67, respectively).

276 patients had a specialist consultation for an outcome indicator condition needing a procedure unable to be done in the community clinic, and requiring hospital or day-facility management (57 skin lesions, 48 cervical dysplasia, 46 female infertility, 45 cataract, 42 requests for female sterilisation, 27 circumcisions in children younger than 5 years, and 11 with gallstone disease). 121 were first seen by a specialist in the outreach clinic and 155 first seen by a specialist in a hospital clinic. Patients first seen in outreach clinics were older, more often had ophthalmological problems, and had more severe illness than those seen in hospital

clinics. Patients seen in hospital clinics tended to have higher rates of surgery than those seen in outreach clinics (log rank p<0·001, unadjusted hazard ratio 0·55 [95% CI 0·42–0·74]; figure 6). The adjusted hazard ratio was 0·67 (0·43–1·03).

TABLE 3. Adjusted main effects, other than outreach, in the final survival analysis and logistic regression models

Main effect predictors	Hazard ratio for completion of referrals	Relative risk for timely completion of referrals*
Community factors		
Road access	0.80 (0.63–1.00)†	0.92 (0.85–0.98) †
Family doctor present	1.03 (0.73–1.47)	1.23 (0.94–1.52)
Patient factors		
Male	0.93 (0.74–1.16)	0.96 (0.80–1.13)
Age (years)		
<15‡	1	1
15–44	0.68 (0.51–0.90)†	0.76 (0.38–1.25)
>45	0.60 (0.43–0.84) †	0.75 (0.42–1.13)
Private health insurance	2.08 (1.50–2.89) †	1.52 (1.31–1.69)
Problem factors		
Injury related	0.60 (0.33–1.07)	1.18 (0.79–1.53)
Cancer related	1.64 (1.02–2.64) †	1.51 (1.04–1.82) †
Severity		
DUSOI 0‡	1	1
DUSOI 1–5	1.33 (0.98–1.80)	1.27 (1.09–1.44) †
DUSOI >6	1.75 (1.21–2.52) †	1.36 (1.02–1.62) †

*Upper limit for acceptable time from referral to specialist consultation: urgent=15 days; semi-urgent=45 days; nonurgent=6 months.
†p≤0.05.
‡Age<15 and DUSOI 0 were reference categories.

The difference in rate of surgery is partly explained by differences in various steps in the process: patients seen in outreach clinics were less likely to have surgery planned (69% [83 of 121] *vs* 85% [131 of 155], p<0·001), less likely to actually have the surgery if it was planned (87% [72 of 83] *vs* 94% [123 of 131], p=0·074), and waited a longer time between referral and operation (median 201 days [IQR 71–487] *vs* 92 days [50–337], p=0·023), although outreach was still associated with a significantly shorter time from referral to specialist consultation in these patients (median 21 days [0–104] *vs* 48 [26–146] days, Wilcoxon rank sum p=0·002).

There were some variations between outcome indicator conditions. The proportion of women requesting sterilisation who were booked for surgery was lower in outreach clinics than in hospital outpatients. A greater proportion of the outreach group was made up by patients with cataract, who had a lower proportion booked than in any other condition. Furthermore ten patients seen in outreach clinics and offered surgery declined it (five were for female sterilisation, four for cataract, and one for inguinal hernia), compared with none in hospital clinics.

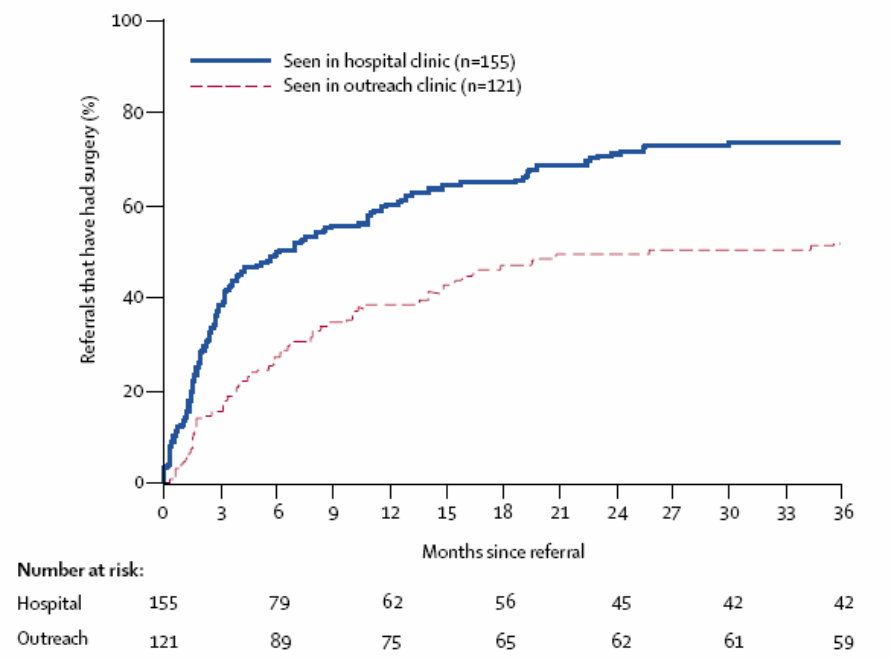

Figure 6. Time from referral to selected definitive surgical procedures in hospital, by location of first specialist consultation

Discussion

Regular specialist outreach clinics more than twice a year to small communities were associated with improved indicators of access and rates of procedures done on site, a tendency to reduced rates of hospital-based treatment, and no significant change in the rates of elective referrals. Outreach clinics improved access in three main ways. First, they increased the rate of completion of elective referrals by 41% overall, and the risk of timely completion according to their urgency rose by 30%. Some of the observed benefit was due to the 10% of patients who had initially been referred to hospital outpatients but who were instead first seen by a specialist at an outreach clinic a median of 208 days later. Without a visiting service, these referrals might never have been completed.

Second, the provision of on-site consultations and procedures saved many patients at least one trip to the city, and in many cases overcame any need for a hospital visit. There was no evidence that outcomes of investigations or minor procedures were worse in remote locations. Although there are reasons why remote residents might want to visit larger centres, the clear message of our previous research was that many residents, especially children, mothers, and elderly people, find hospital visits unnerving or even frightening. Overcoming travel-related difficulties, having familiar surroundings, family, and staff available at on-site consultations, and improved communication between all parties were perceived to be important benefits of outreach clinics. Patients and health staff felt that outreach clinics also helped specialists to understand the remote community environment and its challenges, which facilitated inpatient care and discharge planning, and helped patients to build a relationship with their treating team before hospital visits.[6]

Third, visiting clinics often led to opportunistic attendances by patients who had not been referred, and in many cases had not previously been seen at the clinic for that problem. Population-based surveys have identified a considerable amount of unaddressed illness in Indigenous communities, which could be attributed to insufficient resources for primary care and infrastructure in remote areas.[21, 22] Often, a few days before a specialist outreach visit, a sign was posted at the local store or community centre that read something like “Eye doctor coming this Thursday,” leading to some community members presenting de novo on the day of a specialist visit.

Although some opportunistic presentations were for non-specific problems that primary care practitioners could manage, many others were requests for minor procedures done by a specialist or for specialist investigations. Compared with patients seen in hospital clinics, these patients could have been more deterred by access barriers, since they were more often under 15 or over 45 years of age, more often had visual problems, and their problems were judged to be less severe and less urgent.

The finding that outreach visits were not associated with increased rates of elective referrals by primary care practitioners is contrary to the notion of supply-induced demand, for which there is evidence with respect to specialist referrals in the UK and elsewhere.[23] However, it is consistent with our separate findings of no overall effect of proximity of a surgical specialist on referral rates by family doctors in a large Australian study.[24] Two characteristics of remote community setting probably reduce the tendency for supply to induce demand. The first is that elsewhere much supply-induced demand comes from patients, not primary-care doctors. Indigenous people living in remote communities, however, have endured decades of poor health and restricted access to health services, and their requests for a specialist referral are uncommon. Second, primary-care practitioners who reside in or visit remote communities have broad skills, often with many years of remote community experience, and therefore might be less likely to refer conditions when a specialist is present locally.

We confirmed our hypothesis that on-site procedures would increase with specialist outreach clinics, but noted that both the proportion of patients being booked for hospital-based procedures and the hospital procedure rate were substantially less for patients seen first in outreach clinics. There are many possible explanations of why patients first seen in hospital clinics might have higher rates of surgical procedures than those seen in the community: less delay between booking and the actual procedure; self-selection by patients of those more willing to travel to the city, engage with the hospital system, and undergo surgery; and poor understanding by junior short-term staff in hospital outpatient clinics of the barriers to hospital-based care faced by remote residents, whereas consultant specialists in outreach clinics might have the understanding that may lead to negotiation of management strategies that don't need hospitalisation. Whether fewer hospital-based procedures are good, bad, or otherwise from a patient's viewpoint is unclear. However, from a health service manager's point of view, outreach clinics seemed to decrease, rather than increase, the demand on hospital operating theatres, and concerns that outreach clinics would uncover an overwhelming burden of illness requiring hospitalisation seem to be unfounded.

The strength with which overall conclusions can be drawn from this study is limited by reliance on medical records as the primary data source, and its observational design. There may have been potential confounders for which our study was unable to account. Yet the findings are consistent and plausible. The findings of improved access are supported by our previous hypothesis-generating research,[6, 25] and the important covariates in our model of completion of referrals make sense. For example, completion was adversely affected in older people, who might be less able to get to appointments, and when roads were accessible, people were more likely to return at this time to small outposts on their traditional homelands. Furthermore, more severe problems, cancer-related problems, and privately insured patients were associated with higher completion rates.

The study design also has several strengths, such as recording the effects of the real-world implementation of outreach clinics in a total population. At times during our study outreach clinics were infrequent or irregular, indicating, for example, staffing or service-based limitations, community preferences, or inclement weather. Despite these irregularities, significant and clinically important effects on access were recorded. Loss to follow-up because of care delivered elsewhere was kept to a minimum because of relative isolation of communities, one local source of health care, and one referral hospital available to patients without private health insurance. Care sought from traditional healers, which goes largely unreported to non-Indigenous people, could not be accounted for but is an unlikely

confounder because communities served as their own controls during times when there was no outreach.

How generalisable are our findings to other specialties, and to remote Indigenous and non-Indigenous populations elsewhere? In this study outreach service delivery had an effect that was similar across the four included surgical specialties, suggesting that the findings are applicable to other surgical disciplines. Completion of initial referrals was an appropriate indicator for elective surgical conditions because the first referral is a common and consistent part of each patient's journey for which access barriers are substantial. Generalisability of these findings to non-surgical specialties, however, is more open to question. Chronic medical conditions constitute a large proportion of the disease burden faced by non-surgical specialists in remote communities, for which measures of care coordination and adherence to best practice might be more important indicators than access to the initial specialist consultation and procedure rates.

The Northern Territory model of outreach could apply to regionalised specialists serving remote and disadvantaged Indigenous communities sharing similar needs and who face similar barriers elsewhere in Australia, and in Canada, USA, and South Africa, for example. Peculiarities of the Australian system, including patient travel assistance funded by the government and the requirement for specialist referrals, are unlikely to affect our conclusions and might have reduced the recorded benefit of outreach. Unexplained variability in effect size between the study communities, however, suggests that not all remote communities would benefit in the same way from specialist outreach.

Applicability to rural non-Indigenous settings depends on whether or not specialists are a scarce resource, and on the presence of a population with unmet health needs, substantial access barriers, or both. Successful outreach needs an adequate and motivated specialist base capable of sustaining both local hospital services and outreach services, functioning primary-health care services, and predictable and responsive visits that integrate with local services.[25] The financial costs of outreach—AUD$277 per patient seen in the SOS's early years—depend on local charges for transport, accommodation, specific mobile equipment, service administration, and salaries if more specialists are required.[26]

Virtual outreach[27] could replace some aspects of visiting specialist services, but in many disadvantaged settings, including northern Australia, the necessary infrastructure for telemedicine is unavailable. Trials have begun with a retinal camera operated by a visiting ophthalmic nurse, without specialist attendance, but many other procedures need specialist-level expertise. Furthermore, both the clinical consultative and relationship-building aspects of outreach seemed important in our setting. Ultimately, specialist outreach is likely to be most effective if it is tailored to specific needs and to overcome access barriers faced by the communities served.

Contributors

R Gruen contributed to study conception and design, the acquisition, analysis, and interpretation of data, and drafted the article. R Bailie contributed to study conception and design, the analysis and interpretation of data. Z Wang contributed to study design and analysis of data. S Heard contributed to study conception and design, especially through database development and data collection. I O'Rourke contributed to study conception and design, and interpretation of data. All authors revised the article, except I O'Rourke who, unfortunately, was deceased.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

We acknowledge the support and partnership of the community government councils and health clinic staff, in particular the Aboriginal health workers, in the three communities involved in the study. They provided valuable assistance with study design, conduct, and interpretation. We also thank the

coordinators and specialists involved in the Specialist Outreach Service. Russell Gruen's work on this study was supported by a Medical Postgraduate Award from the National Health and Medical Research Council (NHMRC), and a Surgeon Scientist Award from the Royal Australasian College of Surgeons. Ross Bailie's work in this area is supported by funding through an NHMRC Senior Research Fellowship.

References

1 Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World population prospects: the 2002 revision and World urbanization prospects: the 2003 revision http://esa.un.org/unup (accessed March 20, 2006).

2 WHO, World Health Report 1995: bridging the gaps, World Health Organization, Geneva (1995).

3 RL Gruen, TS Weeramanthri, RS Bailie and SE Knight, Specialist outreach clinics in primary care and rural hospital settings (Cochrane Review), John Wiley and Sons, Chichester, UK (2004).

4 B Hoffmann and RS Bailie, Health and housing-related infrastructure in Northern Territory Aboriginal communities: 2001 data, Cooperative Research Centre for Aboriginal and Tropical Health, Darwin (2003).

5 Australian Institute of Health and Welfare, The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples 2003 (Cat. No. 4704.0), AIHW, Canberra (2003).

6 RL Gruen, RS Bailie, PH d'Abbs, IC O'Rourke, MM O'Brien and N Verma, Improving access to specialist care for remote Aboriginal communities: evaluation of a specialist outreach service, Med J Aust 174 (2001), pp. 507–511.

7 RL Gruen and TFM Yee, Dreamtime and awakenings: facing realities of remote area Aboriginal health, Med J Aust 182 (2005), pp. 538–540.

8 C Mirco, Surgical outpatient department patient survey—Royal Darwin Hospital, NT Department of Health and Community Services, Darwin (1999).

9 J Taylor, Short-term Indigenous population mobility and service delivery (discussion paper 118/1996), Australian National University, Canberra (1996).

10 RL Gruen, S Knox, H Britt and RS Bailie, The Surgical Nosology In Primary-care Settings (SNIPS): a simple bridging classification for the interface between primary and specialist care, BMC Health Services Research (2004), p. 4.

11 RL Gruen, S Knox, P Carson, IC O'Rourke, H Britt and RS Bailie, The demand for surgery: an analysis of referrals from Australian general practitioners, ANZ J Surg 74 (2004), pp. 863–868.

12 GR Parkerson Jr, WE Broadhead and CK Tse, The Duke Severity of Illness Checklist (DUSOI) for measurement of severity and comorbidity, J Clin Epidemiol 46 (1993), pp. 379–393.

13 A Coulter, A Noone and M Goldacre, General practitioners' referrals to specialist outpatient clinics. I. Why general practitioners refer patients to specialist outpatient clinics, BMJ 299 (1989), pp. 304–306.

14 Health Data Standards Committee, Clinical urgency, National health data dictionary (version 12 including version 12 supplement) AIHW cat. no. HWI 73, Australian Institute of Health and Welfare, Canberra (2004).

15 Classification Committee of the World Organisation of Family Doctors (WONCA), ICPC-2: International classification of primary care (2nd edn.), Oxford University Press, Oxford (1998).

16 H Britt, A new coding tool for computerised clinical systems in primary care—ICPC plus, Aust Fam Physician 26 (1997) (Suppl 2), pp. S79–S82.

17 DG Clayton and M Hills, Statistical models in epidemiology, Oxford University Press, Oxford (1993).

18 J Zhang and KF Yu, What's the relative risk?: a method of correcting the odds ratio in cohort studies of common outcomes, JAMA 280 (1998), pp. 1690–1691. 19 Stata statistical software: Release 8.0. College Station, Stata Corporation, Texas (2003).

20 Australian Bureau of Statistics, Experimental estimates for the Indigenous population 1991–1996. ABS cat. no. 3230.0, Australian Bureau of Statistics, Canberra (1998).

21 WE Hoy, RJ Norman, BG Hayhurst and DJ Pugsley, A health profile of adults in a Northern Territory Aboriginal community, with an emphasis on preventable morbidities, Aust N Z J Public Health 21 (1997), pp. 121–126.

22 KM Stamp, SJ Duckett and DA Fisher, Hospital use for potentially preventable conditions in Aboriginal and Torres Strait Islander and other Australian populations, Aust N Z J Public Health 22 (1998), pp. 673–678.

23 M Roland and R Morris, Are referrals by general practitioners influenced by the availability of consultants?, BMJ 297 (1988), pp. 599–600.

24 RL Gruen, S Knox, H Britt and RS Bailie, Where there is no surgeon: the effect of specialist proximity on general practitioners' referral rates, Med J Aust 177 (2002), pp. 111–115.

25 RL Gruen, TS Weeramanthri and RS Bailie, Outreach and improved access to specialist services for indigenous people in remote Australia: the requirements for sustainability, J Epidemiol Community Health 56 (2002), pp. 517–521.

26 RL Gruen and R Bailie, Evaluation of the Specialist Outreach Service in the Top End of the Northern Territory, Menzies School of Health Research, Darwin (2000).

27 P Wallace, A Haines and R Harrison et al., Joint teleconsultations (virtual outreach) versus standard outpatient appointments for patients referred by their general practitioner for a specialist opinion: a randomised trial, Lancet 359 (2002), pp. 1961–1968.