

Evaluation of introducing the team approach to the care of the amputee: the Dulwich study

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Abstract

The effects of introducing the Team Approach to the management of the lower limb amputee has been assessed in a consecutive series of 233 patients over a five year period.

During the first year, baseline data was collected and during the subsequent yearly phases the effects of introducing a physiotherapist co-ordinator, visiting prosthetist and medical officer from the local Artificial Limb and Appliance Centre (ALAC), and finally trained surgeons were studied. During the final phases of the study, the effects of changing team staff were monitored.

The results have shown that only when the full Team Approach is adopted are the best results achieved, but that, once this approach is established, staff changes can be made without serious reductions in effectiveness. The study has shown that the team can reduce in-patient stay by 20 days; reduce the need for post-discharge physiotherapy by 94%; increase the proportion of patients discharged with a prosthesis more than fivefold and increase the effectiveness of long term rehabilitation threefold.

Introduction

In spite of advances in vascular surgery over the last decade, patients with advanced arteriosclerosis are still coming to major amputation when vascular reconstruction and radiological procedures are of no help. At the end of 1984 there were more than 51,000 lower limb amputees in England and Wales (McColl,

1986). Of these, 88% were civilian (rather than war pensioners) and 68% were over 60 years of age.

Many authors (Murdoch, 1984; Little, 1975) have stressed the need for good surgical techniques, ward management, and intense, co-ordinated rehabilitation so that these patients can quickly and successfully return to the community. Rehabilitation of the amputee is not complete however, unless every patient has had the opportunity to be assessed and try an artificial leg. In the majority of the United Kingdom, amputations are carried out at District General Hospitals (DGH) in which typically only 5-10 are carried out annually. The surgery is performed by junior surgeons who have little experience in amputations and generally less knowledge of prosthetic prescription (McColl, 1986). The patients can wait up to 60 days to visit their local ALAC and this is often a distance of 60 miles, involving a 2-3 hour ambulance journey (Hutton and Rothnie, 1977). It is only at the few specialist centres such as Roehampton, London and Dundee, Scotland that staff are knowledgeable about correct surgical management, the team approach to rehabilitation and modern prosthetics. These centres are in close contact and proximity to an ALAC which makes prosthetic supply, alteration and repair a quicker process than it is for the rest of the country (McColl, 1986).

The authors' centre is a busy vascular unit without an ALAC on site (and therefore typical of many DGH's). In 1981, a general dissatisfaction with the services provided to the hospital by the local ALAC prompted moves to improve the management of patients. These moves have included improving both the patient

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assessment and preparation, the surgery and the rehabilitation, as well as introducing the team approach and the visiting services of the ALAC to the hospital. The changes in management which were introduced in distinct phases and the subsequent results of their introduction are reported here.

Patients and methods

Patients with peripheral vascular disease who are referred to the Camberwell Health District in London are dealt with either at King's College or at Dulwich Hospital. Of the patients requiring amputation, the majority (81%) come from this health district and 95% are from the lower social classes. Over the five year period 1981–86, 233 patients have undergone lower limb amputation for vascular insufficiency in this district, the greater majority on the Dulwich site. All the patients were managed throughout their entire stay on acute general surgical wards at either site.

The five year period was divided into annual phases so that the specific changes in management could be evaluated (Table 1). During *Phase I* (1981–82) base line data were collected from the two sites. Patients were managed by either the general or vascular consultant surgeon under whom they were referred and the amputation was performed under a general anaesthetic by a surgical registrar in training. Following surgery, a crepe bandage was used to cover the wound and the stump was often immobilized by sand bags or sheets to prevent flexion contractures

developing. There was no routine antibiotic or analgesia cover and the post-operative management varied with each consultant. Physiotherapy sessions generally lasted half an hour and were given either by a junior or student physiotherapist. Early mobility walking aids were not used routinely and consultants were often actively opposed to their use. Patients were referred to the ALAC using a standard Department of Health and Social Security (DHSS) form (AOF3) and they generally attended for their first appointment while they were still in-patients. Once the patients were medically stable, they were discharged either on crutches or using a wheelchair. In a few cases only had a home visit been carried out by the occupational therapist. Patients received their prostheses as out-patients and then reattended the physiotherapy department until they were either walking independently or had discarded their prostheses totally.

During *Phase II*, changes were implemented on both sites. At Dulwich a full-time senior physiotherapist was appointed to co-ordinate the amputee rehabilitation. The amount of physiotherapy the patients received increased and they were treated together as a group. The physiotherapist co-ordinated the post-operative management, communicated with the other staff members and started a weekly multidisciplinary team meeting. The physiotherapy on the King's site remained unchanged. Also in *Phase II*, the visiting services of an ALAC Medical Officer (MO) and a prosthetist from Vessa Ltd. was started on a weekly basis to both the hospitals.

Table 1.

Phase	Hospital	Protocol
1 (1981–1982)	KCH	— Base line data of standard treatment collected.
	DH	— Base line data of standard treatment collected.
2 (1982–1983)	KCH	— Addition of the ALAC Medical Officer & Prosthetist.
	DH	— Addition of the ALAC Medical Officer & Prosthetist & Senior Physiotherapist/Co-ordinator.
3 (1983–1984)	KCH	— As phase 2.
	DH	— As Phase 2 plus surgical involvement, use of TcpO ₂ for level selection & increase in staff education and teaching.
4 (1984–1985)	KCH	— Change in Surgeon & ALAC Medical Officer. Co-ordination by Physiotherapy Department began.
	DH	— Changes in Surgeon, ALAC Medical Officer & Physiotherapist/Co-ordinator.
5 (1985–1986)	KCH	— Patients transferred to DH either pre- or post-operatively.
	DH	— Change in Surgeon & appointment of Physiotherapist/Co-ordinator.

The MO and prosthetist assessed the patients, measured and delivered the prostheses to the patients while they were still in hospital. Patients on the Dulwich site were not discharged until they were fully rehabilitated, either on a prosthesis or from a wheelchair.

During *Phase III*, and on the Dulwich site only, the involvement of the surgeons completed the team approach. Senior registrars (surgeons in the final stages or training) who had an interest in amputee rehabilitation visited Roehampton and gained up to date knowledge regarding surgical techniques and modern prosthetic needs (McColl, 1986). In addition, improvements were made in the diagnostic tests provided by the Vascular Laboratory for the assessment of amputation level. Particular emphasis was placed on the use of transcutaneous oxygen (TcPO₂) measurements (Butler, 1986). The amount of day to day teaching and education by the physiotherapist and surgeon on the modern management of these patients also increased during this phase. The service on the King's site remained unchanged from *Phase II*.

During *Phase IV*, there were changes in staff on both sites. At King's there was a change in the surgical registrar and a physiotherapist began to act as co-ordinator for the amputees on that site. At Dulwich there were three staff changes. The surgical registrar in training rotated to another surgical firm; the physiotherapist co-ordinator left for another department and as a consequence there was a four month interval preceding the appointment of a new physiotherapist co-ordinator (which occurred at the start of *Phase V*) during which time the team was co-ordinated by a junior physiotherapist as part of her normal workload; lastly there was a change in the ALAC MO.

During *Phase V*, patients were transferred wherever possible from King's to Dulwich pre-operatively so that they could benefit from the full-time physiotherapist and the team approach to rehabilitation. Due to these transfers, *Phase V* results are reported for the Dulwich site only. At Dulwich during this phase a new full time physiotherapist co-ordinator was appointed and there was the annual change of surgical registrar.

Table 2.

Phases	1981-82 I	1982-83 II	1983-84 III	1984-85 IV	1985-86 V
<i>King's College Hospital</i>					
Total patients	19	8	16	13	—
Total rehabilitated	10	7	13	10	—
Average age	67	70	70	65	—
Hospital mortality	3(16%)	1(12%)	2(12%)	2(15%)	—
Final proportion at AK level	74%	87%	69%	23%	—
Patients suitable for prosthesis	10	7	11	10	—
Days from operation to measurement	32.0	28.0	30.0	23.0	—
Days from measurement to delivery	14.0	7.0	7.0	7.0	—
% of suitable patients discharged with a prosthesis	10%	100%	100%	100%	—
Hospital stay (days)	60.0	96.0	74.0	60.0	—
Outpatient physiotherapy	47.0	24.5	3.5	6.3	—
% using prosthesis at 1 year	29%	50%	80%	60%	—
<i>Dulwich Hospital</i>					
Total patients	25	32	43	36	41
Total rehabilitated	17	21	35	23	30
Average age	71	72	68	71	69
Hospital mortality	5(25%)	8(25%)	7(16%)	11(31%)	11(32%)
Final proportion at AK level	88%	62%	39%	44%	33%
Patients suitable for prosthesis	12	15	27	16	27
Days from operation to measurement	65.0	21.0	13.5	17.5	22.2
Days from measurement to delivery	29.6	7.5	7.0	8.6	7.0
% of suitable patients discharged with a prosthesis	17%	93%	89%	94%	100%
Hospital stay (days)	71.5	63.3	51.0	51.0	50.8
Outpatient physiotherapy	29.8	1.8	0.8	4.1	1.7*
% using prosthesis at 1 year	36%	91%	85%	79%	94%*

* These figures are for 10 months only.

Results

To evaluate the introduction of the team approach, the base line data (*Phase I*) from King's and Dulwich is compared with *Phase II* and then *Phase III*. To evaluate the effects of staff changes comparison should be made between the results in *Phases IV and V* and the earlier phases (Table 2).

In *Phase I*, all the patients were of a similar age, 73% suffering from arteriosclerosis and 20% diabetes. The majority of amputations (74% at Kings and 88% at Dulwich) were at the above-knee level and the hospital stay was 60 and 72 days respectively. Only three patients (one at Kings and two at Dulwich) received a prosthesis while they were in-patients. The patients re-attended for out-patient physiotherapy following prosthetic delivery an average of 47 times/patient at Kings and 29.8 times/patient at Dulwich. The percentage of patients using their prostheses functionally at one year was 29% and 36% respectively (these figures are affected by the deaths which occurred following discharge, three for the King's group and one for the Dulwich group).

In *Phase II* on the King's site, with the addition of the visiting services of the ALAC MO and prosthetist to the hospital, the results show that there was an increase in the number of patients discharged with a prosthesis (100%). There was also an increase in the hospital stay (from 60 to 96 days) and in the percentage using their prosthesis functionally at one year (29% to 50%)—(these figures take into account one death in the 12 months following discharge). There was also a decrease in outpatient physiotherapy reattendance (from 47 to 24.5 visits/patients).

In *Phase II*, at the Dulwich site (with the addition of the visiting ALAC and the physiotherapist co-ordinator) there was a similar increase in patients discharged with prostheses (17% to 93%) in its subsequent functional use (36% to 91%) (again these figures take into account the 4 deaths which occurred following discharge). There was also a decrease in the hospital stay (63.3 from 71.5 days) and outpatient re-attendance (1.8 from 29.8 visits/patient).

The percentage of above-knee amputations on both sites remained high but the days to prosthetic assessment and delivery began to decrease.

In *Phase III* on the King's site, the services remained unchanged from *Phase II* and the results were similar. On the Dulwich site, as the surgical involvement completed the team, the percentage of amputations at the above-knee level decreased to 39% and the hospital stay and out-patient re-attendance were reduced further. Prosthetic measurement and delivery times from operation were also further reduced, especially on the Dulwich site with both the improved surgery and with the more careful co-ordination of the treatment of the patients. Functional use of the prosthesis in the team approach situation at Dulwich continued to increase as the patients were fully rehabilitated at discharge. This figure remained low at King's.

In *Phase IV* at King's, with the greater level of education in the District and a change in surgical staff, there was a dramatic reduction in the final percentage of above-knee amputations (23%). A physiotherapist acted as a part-time co-ordinator for these patients during this phase and there was a further reduction in hospital stay, days from operation to prosthetic delivery and functional use of the prostheses. Out-patient re-attendance increased. The ALAC MO increased the prescription of P.T.B. rather than AK/BK prostheses with a subsequent increase in days from operation to measurement at the Dulwich site. At Dulwich there was also a change in surgical staff and this may account for the increase in hospital mortality and increase in amputations at the above-knee level. The physiotherapist co-ordinator also changed during this phase and the team was co-ordinated by a junior physio. This could account for the increase in outpatient re-attendance and decrease in functional use of the prostheses.

During *Phase V* at Dulwich, a new senior physiotherapist co-ordinator was appointed and the surgeon in training also rotated. The hospital mortality remained high and the number of days between operation and measurement increased by almost five days. These results could be a reflection on both the surgeon and the prosthetic prescription by the MO. As the in-patient stay remained constant the number of days available for prosthetic training fell to 28.6 days from 37.5 days (a reduction of 8.9 days), a level at which it has been in *Phase III* with experienced team members.

Delivery times of the prostheses have remained almost constant (around one week)

during the four phases that the prosthetist has been visiting the hospital.

Discussion

The results show the value of the multidisciplinary groups that are so often mentioned in the make-up of the team approach (Murdoch, 1977).

Amputees who are not rehabilitated while in hospital have to await long periods of time to receive their prostheses (McColl, 1986). Once they take delivery of the artificial limb, many outpatient physiotherapy sessions are required and few gain good functional use of their prostheses (*Phase I*). When the cost of the hospital stay and the outpatient re-attendance are added together, "rehabilitation" for these patients is very expensive.

Providing the patients with an artificial limb while they are inpatients, but without adequate physiotherapy is again of little benefit either functionally or as a cost saving exercise (King's *Phase II*). Providing patients with prostheses, the appropriate physiotherapy and co-ordinating their rehabilitation, reduces the hospital stay and out-patient re-attendance, increases the functional use of the prosthesis and is a cost saving exercise for the Health District.

When surgical involvement is added (Dulwich *Phase III*), patients benefit as both their knees and subsequent expenditure during walking energy are saved (Finch et al, 1980; Romano et al, 1971; Robinson, 1972). As the stumps are also technically better, the ALAC staff can supply the prostheses sooner, which also helps to reduce the hospital stay. The percentage of amputations at the below-knee level increased during this study though the patient type remained unchanged. With the reduction in the energy required for walking which this produces (Waters et al, 1976), more patients were able to continue to use their prosthesis functionally.

The present study clearly shows that even with the inevitable staff changes in a National Health Service, which uses staff-in-training to help run the service, these positive results can be maintained and continued (*Phase IV & V* Dulwich) as long as there is at least one experienced person who has the energy and enthusiasm to continue organizing the team, and the ability to continue the staff training and education programmes.

Conclusion

For a long time, the amputee had been sadly neglected in this Health District as in many others throughout the United Kingdom (D.H.S.S., 1972). The morale, interest and knowledge of the staff dealing with these patients was low as was the morale of the patients themselves.

The team approach to the management of these patients and to other disabilities alike, has been well documented since the second World War. Up to now it has only been practised in a few specialist centres in this country. Implementing the team approach in phases has shown both the value of each team member and how the results alter as each professional interacts in amputee rehabilitation. For its successful adoption and implementation however, it must have the support of the consultant in charge of vascular surgery. There are some benefits with improved physiotherapy and intensive, co-ordinated rehabilitation, some with the improved surgery and improved medical management. The introduction of the visiting services of the ALAC MO and prosthetist to the hospital site to assess, measure and deliver the prostheses also had some benefits, but it is only when all these disciplines work together that the maximum is achieved for the patient and staff alike (Hutton and Rothnie, 1977).

Continuous education and training programmes are essential and must be the responsibility of every teaching hospital where medical, physiotherapy and nursing students are trained for the benefit of the rest of the country. Perhaps the most important point to emerge from this study is the fact that the team approach can and does work in a hospital that is not a specialist amputee centre and should be possible and feasible in every Health District carrying out more than 20 amputations annually.

Acknowledgements

The authors gratefully acknowledge the help of many colleagues in this study. In particular thanks are due to Mr. L. T. Cotton and Professor V. V. Kakkar under whose care the patients were admitted, Messrs K. Lafferty and C. M. Butler the principal surgeons in training and Drs. D. Thornberry and R. Luff the visiting ALAC medical officers. The financial support of the King's College Joint Research Committee,

the Rank Trust and BLESMA is also gratefully acknowledged.

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