

An epidemiological study of war amputees and the cost to society

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Abstract

The purpose of this study was to assess the overall financial cost of the prosthetic care which war amputees have incurred since the injury occurred.

Records of 98 war veteran amputees who had attended the Dundee Limb Fitting Centre were scrutinised, they revealed 52 survivors and 46 who had died by 1997 and represented all the records available at the time of the review. The number and nature of visits, the number of prosthetic limbs ordered were counted and using today's costs, the cost of these services calculated.

The costs of stump socks, transport and social security payments were not included.

The cost of the artificial limbs was calculated at £(GBP)69 million with the recognition that it is an underestimate and approximation. Despite this it shows that the cost, allowing for the underestimation, has been relatively insignificant in the total cost of a major war and the war machinery.

The cost however to the individuals has been considerable with a substantial disability occurring at the prime of life resulting in a significant handicap.

It is a continuing legacy that society is responsible for, as a direct result of armed conflict.

Introduction

In all armed conflicts there is considerable advantage in maiming rather than killing one's foes. The injuries thus sustained occupy much

time and medical resources which if the individual had died would not have been incurred, tying up manpower that could be used in a more "war effective" way.

Upper and lower limb amputees have been one of the sequelae of war since man began to become involved in conflict. They represent a significant number of survivors who, following discharge from the services, continue to need clinical services to maintain their independence.

A clinical record review of all war pensioners who are attending or those who have attended the Dundee Limb Fitting Centre (DLFC) since 1945 was undertaken.

Records at DLFC consist of both a medical file and a limb file.

Limb files of the survivors contain details of the prosthetic activities since the injury.

Medical records from 1965 are still held for both alive and deceased patients although limb files for those patients who are deceased have been destroyed. This valuable source of data has been scrutinised and using the current costs for limbs and clinical events an estimated overall cost of the care has been calculated.

At the end of World War I there were at least 29,400 British lower limb amputees and 11,600 upper limb amputees, and at the end of World War II a further 12,000 amputees. The Falkland conflict produced a further 32 limbless servicemen. In addition there are amputees from other conflicts but the numbers are not available. (Source British Limbless Servicemen's Association personal communication).

It is salutary to note that by the end of 1938 in the United Kingdom there were only 3,400 amputees who had between them had 142,600 artificial legs and 31,600 arms (Ministry of Pensions, 1939).

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Method

Medical records and limb file records were retrieved for the war pensioners identified from the authors' data base. The medical records for those patients who had attended the Limb Fitting Centre since 1965 were available and the limb files of those surviving patients were available from the date of their injury to the present date. For the deceased patients only medical records were available for those who had been seen at the Limb Fitting Centre from 1965 onwards. These are those from Tayside and North East Fife two counties of Scotland.

The details were not always complete although some information could be obtained by comparing both limb file and the medical records. Where the records conflicted with each other the data was ignored.

There were some 98 patients identified, 87 from World War II, 8 from World War I, 2 from the Korean War and 1 from the Falklands.

It should be noted that the World War I files were extremely sparse in their information with an extraordinary lack of detail. World War II patients' records however, had slightly more information.

Discussion

War related amputees are a group of individuals who present with continued need for health service provision.

This group of patients displayed a similar distribution of level of amputation as that reported by Soloren *et al.* (1965) with a significantly higher proportion of upper limb amputees than all others attending limb fitting centres in Scotland with 23 (23%) out of the 98.

For those for which the information was available, 38 (55%) had left and 31 (45%) had right-sided amputations which is similar to the Centre's vascular related patients experience (Table 1). Although not statistically significant it

Table 1. Level of amputation.

| | | |
|----------------------|-----------|----------------------|
| Upper limb: | | |
| Trans-radial | 12 | |
| Trans-humeral | 9 | |
| Hand | <u>2</u> | |
| | 23 | |
| Lower limb: | | |
| Trans-tibial | 40 | |
| Knee disarticulation | 1 | |
| Trans-femoral | <u>34</u> | |
| | 75 | 98 - Total all male |
| 38 Left | 31 Right | 19 side not recorded |

is an interesting similarity which is difficult to explain.

Those from World War I were reported as having been injured in "France" with only 8 surviving in the Tayside catchment area (Table 2).

The average age of the amputee at the time of the trauma was 25.9 years which seemed at first sight a little old to the authors. However conscripts were enlisted up to the age of 50 years. This contrasts with the average age of the vascular amputee of 70 years (Stewart and Jain, 1993).

The average of death in the 16 for whom records were available containing this information was 50 years, with the arm amputees surviving to 80 years, although the numbers are small and significance is questionable. In this fairly young age group of lower limb amputees death might perhaps relate to other injuries sustained, but this data is not available. This survival contrasts with the current survival for vascular amputees of 6 years 6 months (Stewart *et al.*, 1992).

Soloren *et al.* (1965) report of 311 Finnish war veterans found very little evidence of increasing circulatory disease but Weiss (1990) reported

Table 2. Area of conflict where the subjects lost their limbs.

| | | | | | |
|---|----|-----------|----|--------------|----|
| Africa | 11 | Holland | 1 | Singapore | 1 |
| Belgium | 1 | Italy | 16 | Syria | 2 |
| Burma | 2 | Korea | 2 | UK | 5 |
| Falklands | 1 | India | 1 | Not recorded | 22 |
| France | 17 | Malta | 1 | World War I | 8 |
| Germany | 6 | Palestine | 1 | | |
| Those "not recorded" appear to be from the WWII on account of their age | | | | | |

Table 3. Age and survival details.

| | |
|---|--|
| Age at amputation | 25.9 years |
| Current age of survivors | (52) 74 years (range 70-101) |
| Average age of those deceased | (46) for whom records were available (16) was 50 years |
| Average age of deceased upper limb amputees | (3) 81 years |
| 46 had died by the time of the study | |
| 52 survivors | |

75% in a series of 97 amputee veterans as having vascular disease. The war related amputees in the Dundee group have never had a further amputation for vascular disease which contrasts significantly with the other reported paper.

Each patient had an average of 7 new prosthesis in the 52 year period, each limb lasting about 7 years, this is much longer than that reported by Lowry (1967) of 3.3 years. This latter report is of United States (US) veterans as opposed to United Kingdom (UK) veterans and the explanation may be in the different funding arrangements. The current DLFC data indicate that in the first 5 years after the amputation each vascular related amputee has on average 2 new artificial limbs and at least 1 socket change. This is similar to the war amputees who were always supplied with 2 limbs.

Fourteen (14) of the 18 trans-tibial amputees for whom continued data is available, were converted to Patellar Tendon Bearing prostheses with 4 still preferring the old thigh corset prosthesis with which they were initially issued. It is significant that despite modern technology some patients still prefer the original device.

None of the arm amputees changed their

Table 4. Visits – limb and socket delivery.
For surviving amputees (52)

| | |
|------------------------|------------|
| Each patient had: | |
| 7 new limbs | |
| 4 socket changes | |
| Trans-tibial | 3 /patient |
| Trans-femoral | 4 /patient |
| Each patient attended: | |
| Upper limb | 48 visits |
| Lower limb | 72 visits |
| Trans-tibial | 66 visits |
| Trans-femoral | 80 visits |

Table 5. Estimated cost of outpatients' visits.

| | |
|---|--|
| Cost – Average at today's prices – UK/Scotland (Source: CSA Edinburgh) | |
| 8 upper limb @ 48 | = 384 visits |
| 44 lower limb @ 72 | = 3,168 visits |
| | = 3,552 visits @£50/visit consultation fee |
| | = £177,600 |

prosthesis type and this perhaps is a reflection of lack of development of upper limb services although some patients have converted from leather to plastic sockets, but the basic device remains the same.

The trans-femoral amputees in the study, 6 of the 15 for whom accurate records remain still use metal sockets although some of the 6 have tried plastic and modern technology but have still preferred the original device.

In this study 8 upper limb amputees attended 384 times (48 per patient) which is much less than the 44 lower limb amputees who attended 72 times per patient. This represents a total of 3,552 visits which at today's cost of £50 per visit

Table 6. Prosthetic expenses in today's terms.

| | |
|------------------------|-------------------------|
| New limb costs | |
| 8 upper limb patients | |
| 6 BE | x £960 x 7 = £40,320 |
| 1 AE | x £960 x 7 = £6,730 |
| 1 Hand | x £500 x 7 = £3,500 |
| 44 lower limb patients | |
| 20 TF | x £803 x 7 = £112,420 |
| 23 TT | x £1,660 x 7 = £267,260 |
| 1 KD | x £1,500 x 7 = £10,500 |
| Socket costs | |
| 8 upper limb patients | |
| 6 BE | x £450 x 4 = £10,800 |
| 1 AE | x £450 x 4 = £1,800 |
| 1 Hand | x £500 x 4 = £2,000 |
| 44 lower limb patients | |
| 20 TF | x £400 x 4 = £32,000 |
| 23 TT | x £400 x 4 = £27,600 |
| 1 KD | x £400 x 4 = £1,600 |
| Total costs | |
| Limbs | £440,720 |
| Sockets | £76,800 |
| | = £517,520 |
| | (\$853,908 @ \$1.65/£1) |

Table 7. Limb types.

| | |
|-------------------------|--|
| Initial limb supplied | |
| Trans-tibial | Thigh corset leather socket |
| Trans-femoral | Metal socket 'H' type |
| Current limb being used | |
| 6 patients have | Metal socket trans-femoral |
| 9 patients have | Plastic (4 ICS; 5 Quad) |
| 4 patients have | Thigh corset, leather socket trans-tibial prosthesis |
| 14 patients have | PTB |
| 4 patients have | FI 'below elbow worker' |
| 7 patients have | BI above elbow prostheses |
| 1 patient has | Commuted arm |
| 1 patient has | Partial hand |

(\$82.5 US) represents £177,600 in total (\$293,040) for the attendances alone.

The new limb and socket costs for this period were £517,520 (\$853,908) at present day costs.

The number of original amputees who came from this area at the end of 1945 is not known. In 1965 there were 98 which represents about 1% of the number known (7,000 WWII and 3,700 from WWI) at the end of the conflict. The number who had died by this time is not known but the 1% in this area would seem a reasonable basis for the rough calculations.

Therefore extrapolating this figure to the whole of the UK bearing in mind that Tayside and North Fife have approximately half a million people and the UK has 55.5 million people, the cost to the UK in today's terms of the war amputees is at least £69,512,000 which is equal to \$114,694,800 (Table 8).

Conclusion

This group of individuals represents an

Table 8. National costs.

| |
|--|
| Accepting the approximations |
| Population of Tayside and North Fife, Scotland as 550,000 |
| This is about 1% of UK population (55 million) |
| The costs of out-patient appointment for surviving war pensioners since 1965 |
| = £177,600 x 100 = £17,760,000 |
| The costs of the service for the war pensioners from 1945 to date |
| is £51,752,000 + £17,760,000 |
| = £69,512,000 |
| (\$114,694,800 @ £1.65/£1) |

important continuing responsibility for the UK Government. The continued cost implication is not insignificant and represents a continuous responsibility that war imposes on society.

In this study all amputees were male and the majority were as the result of World War II.

There was a high incidence of upper limb amputees which is significantly different from the current primary limb referral pattern. This has implications in that the expertise in caring for the upper limb amputee which was significant in the post-war years is reduced. This potentially means that as the war amputee population declines the expertise reduces. This may result in the need for specialist centres where sufficient numbers of patients are seen, enabling a high standard of care to be maintained.

This also is true for the surgical skills which were learnt during the wars. In the western world the expertise for repairing blast injuries and gunshot wounds is limited to a few specific centres. The development of such skills in the light of modern orthopaedic and vascular advances is resultantly difficult but for those of us fortunate to live in a peaceful environment this is a small price to pay for peace. For those less fortunate however the limited surgical developments may be to the overall detriment of the casualties

As expected the amputees were young at the time of injury and therefore have required care for over 50 years.

The cost, in today's terms, of the supply of artificial limbs has been considerable at £69 million and this figure is probably a significant under-calculation as waiting repairs and incidental costs, e.g. stump socks, pain medication and pension costs have not been measured. The records are admittedly not complete and do not indicate the hidden costs of potentially reduced earnings, mobility costs and the huge psychological cost to both the amputee and family.

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