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Epidemiology of lower limb amputees in the north of the Netherlands: aetiology, discharge destination and prosthetic use

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Abstract

The aim of this study was to give a retrospective review of all lower limb amputations performed in the 3 northern provinces of the Netherlands in 1991-1992. Assembled data were compared with the existing information in the National Medical Register (NMR) over the same period.

With the participation of all regional hospitals, 473 lower limb amputations from transpelvic to transmetatarsal level were identified. Of the amputations 94% were performed for vascular pathology, 3% for trauma, and 3% for oncologic reasons. After surgery a prosthesis was provided to 48% of the amputees.

The actual number of performed amputations exceeds the number of amputations registered by the NMR by 9%. Incidence rates of lower limb amputations in the Netherlands are 18-20/ 100,000 over the last 12 years. These numbers are lower than in other areas and show no sharp decrease in frequency compared with other countries in Western Europe.

Introduction

The number of recorded lower limb amputees with an amputation level ranging from transpelvic to tarsometatarsal has not changed in the Netherlands over the last ten years. The total number of primary lower limb amputations is about 2,000 per year in a national population of 15 million people. (Central Bureau of Statistics, 1995; SIG Health care information, 1994). Recent Dutch studies (Dwars, 1990; Hoofwijk, 1990; Hoogendoorn, 1988) collect data from the National Medical Register (NMR). These NMR data concern all major lower limb amputations performed in the Dutch hospitals.

Data collected by the NMR are compiled by the operating surgeons and hospital staff who record these data. Total results are then gathered by the NMR.

These national data only show the number and level of amputation operations, sex, age and average hospital stay.

There is limited knowledge about the cause of amputation, discharge destination and follow-up of these amputees in the Dutch population.

It is known that only 15% of the lower limb amputees in the north of the Netherlands are admitted to a rehabilitation centre for prosthetic fitting and training (Rommers *et al,* 1996).

The north of the Netherlands comprises 3 provinces; Groningen, Friesland and Drenthe. The total number of inhabitants in this region is 1.6 million people. This study was aimed at identifying the total group of lower limb amputees who underwent surgery in the north of the Netherlands. Aetiology of the performed amputations, discharge destination and prosthetic fitting would be studied. The actual number of amputations performed in the north

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of the Netherlands would be compared to the total number amputees registered by the NMR in the same area. This comparison gives information about the reliability of the national data. Local and national data would be compared with previously published international studies about amputation surgery of the lower limb in the literature over the last 10 years.

Methods

National data

National data over the period 1982-1993 was obtained from the NMR.

This included all national recorded lower limb amputation operations, their amputation levels according to the codes used by the NMR, age and sex of the operated patients. The frequencies of amputation levels at trans-femoral (TF), knee disarticulation (KD) and trans-tibial level (TT), in the north of the Netherlands, were separately given by the NMR.

Local data in the north of the Netherlands

All surgeons in the 18 hospitals in the north of the Netherlands (one university and 17 general hospitals) co-operated in this study, after confirmation by the medical staff or the management of the local hospital. The operating surgeons identified their lower limb amputation operations performed in the years 1991 and 1992.

This included research of computer databank information where available, and was completed by a check of the operating theatre record books. This data was compared to the number of operations coded to the national health service and the insurance companies. This was done in order to have a complete overview of all performed amputation operations in both years.

After completing the patients lists the medical records were gathered by the hospital staff and were studied by the authors.

The operation level and the number of operations performed on each patient was checked in the operation records written by the operating surgeons. All additional information was gathered from the medical correspondence from the surgeon to the patient's general practitioner (GP). When necessary additional information concerning prescription of a lower limb prosthesis and rehabilitation, was obtained from the hospital's rehabilitation physician or from correspondence by the nursing home doctor.

After completion of the data according to a checklist of date and location of the lower limb amputation, discharge destination and rehabilitation programme, all identifying patient and hospital information was removed from the checklist and data was entered anonymously into a database computer. Afterwards data was only comparable by province location, in the same way the national data is published. This was in order to assure the required privacy of patients data according to rules given by the medical-ethical committee of the University Hospital Groningen.

Re-amputation was defined as amputation at a more proximal anatomical level than a former amputation. Operation procedures at the same anatomical level were defined as stump revisions and therefore not counted in this analysis.

Bilateral amputations in the same operation session are counted by their individual amputation operation.

Results

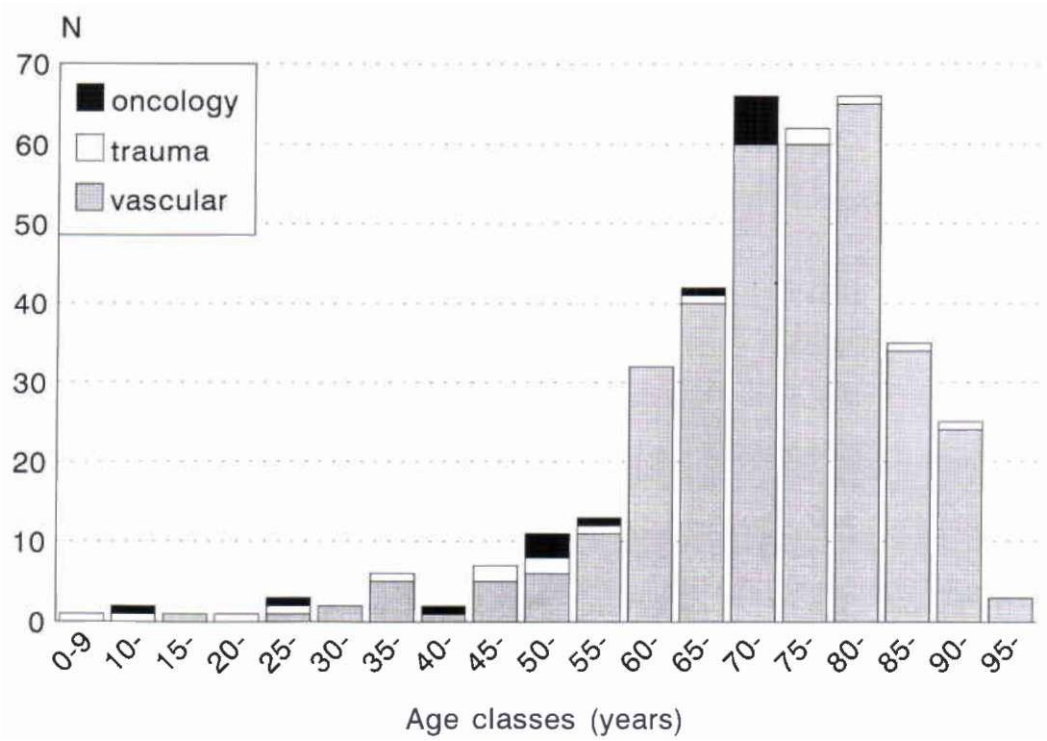
Studied population

During the studied period in the north of the Netherlands 473 lower limb amputation operations were performed. This included all

Table 1 Patient characteristics of all 473 lower limb amputations

Sex	Male	61%
Age	>65	79%
Amputation level	HP+HD	1%
	TF	35%
	KD	12%
	TT	47%
	Foot	6%
Reason for amputation	Vascular	94%
	Oncology	3%
	Trauma	3%
Re-amputation		17.5%
Prosthesis		48.3%

HP: Hemi-pelvectomy; HD Hip disarticulation; TF: Trans-femoral; KD: Knee disarticulation; TT: Trans-tibial: Foot: Transmalleolar to tarsometatarsal



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Age classes (years)

Fig. 1. Age distribution of all (N=415) lower limb amputees with the reason for amputation.

amputation from trans-pelvic to trans-metatarsal level. The age distribution of all patients related to the cause of amputation is given in Figure 1. Patient characteristics are shown in Table 1.

In this geographic area 94% of the operations were performed as a result of vascular problems. The number of diabetic patients could not be clearly identified using the data and was therefore omitted.

All 473 amputation operations were performed on 415 patients. Of these operations 17.5% were re-amputations.

Of these 473 amputations 448 lower limb amputations (94%) were performed at trans-femoral (TF), knee disarticulation (KD),and trans-tibial (TT) level.

Discharge destination and prosthetic fitting

Of all 415 operated amputee patients 47 (11%) died during the hospital stay, due to complications and co-morbidity. Information about the discharge destination after hospital stay was not always available from the studied data. In a minority of cases the name of the nursing home was not stated in the discharge letter. In other cases a home for the elderly was mixed up with a nursing home or even with the rehabilitation centre. By careful study of the clinical notes and the admission data in nursing homes in 96% of the cases the valid discharge destination could be found (Fig. 2). The majority of patients (40%) in the area were discharged to a nursing home. As found in a previous study in this territory (Rommers *et al,* 1996) only 16% of the patients were discharged directly to the rehabilitation centre and 3% of the amputees were transferred to a home for the elderly. Not all patients stayed in their primary discharge location but were relocated to their home, rehabilitation centre or nursing home when appropriate.

A total of 191 patients (48%) were fitted with a prosthesis. This included the bilateral amputees who were provided with two appropriate prostheses. Of these 191 patients 39% received their first prosthesis during nursing home stay, 33% were treated in a rehabilitation centre and 22% were seen in outpatient clinics in the regional hospitals and were fitted with a prosthesis at home. Some 5%

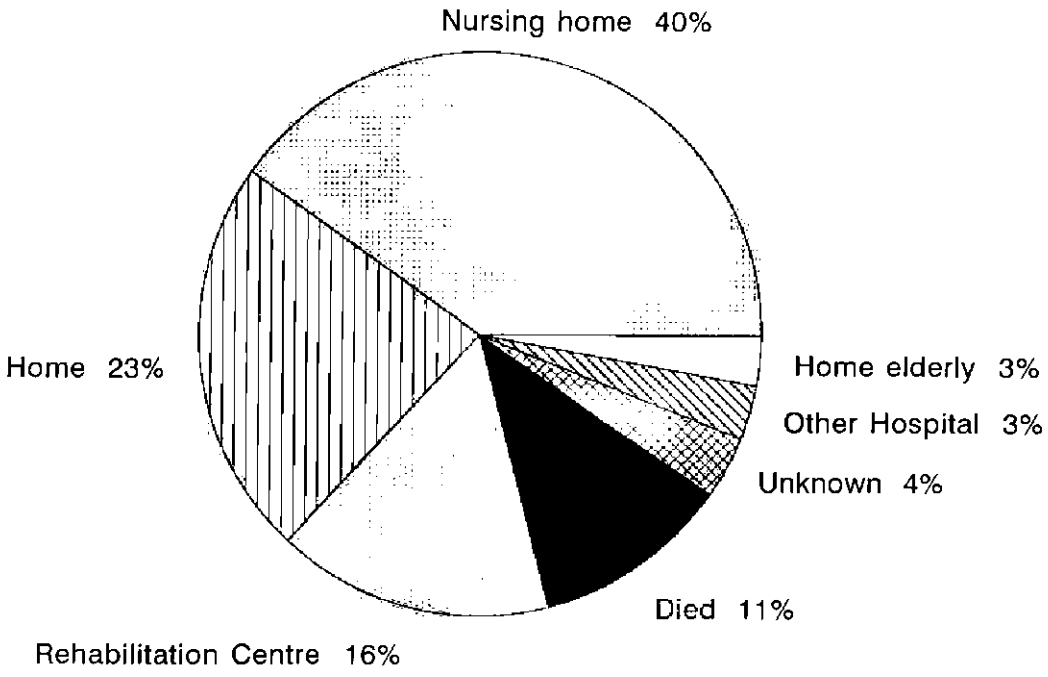


Fig. 2. Discharge destination of all (N=415) lower limb amputees Discharge from operation hospital: north of the Netherlands 1991 -1992

were rehabilitated in the operating hospital or in another hospital in the region and 1% stayed in a home for the elderly and were supplied with a lower limb prosthesis in the local hospital.

National data compared with data in the north of the Netherlands

National data over the period 1982-1993 was obtained from the NMR in Utrecht, The Netherlands. These data show a slight increase in the incidence of lower limb amputations from 18/ 100,000 in 1982 to 20/ 100,000 in 1993. The level of amputation in the lower limb is becoming more distal over the studied years (Fig. 3). There was a sharp decline of TF amputations after 1982, The number of TT amputations is increasing as well as the number of foot amputations. The incidence of KD amputations varied, but averaged 1.8/ 100,000 for 1985-1993.

In the last few years the incidence of foot amputations (transmalleolar to transmetatarsal) increased to 3.3/ 100,000. The actual number of lower limb amputations nation-wide is about 3.000 per year instead of the 2,000 primary amputations recorded and published by the NMR (SIG Health care information, 1994).

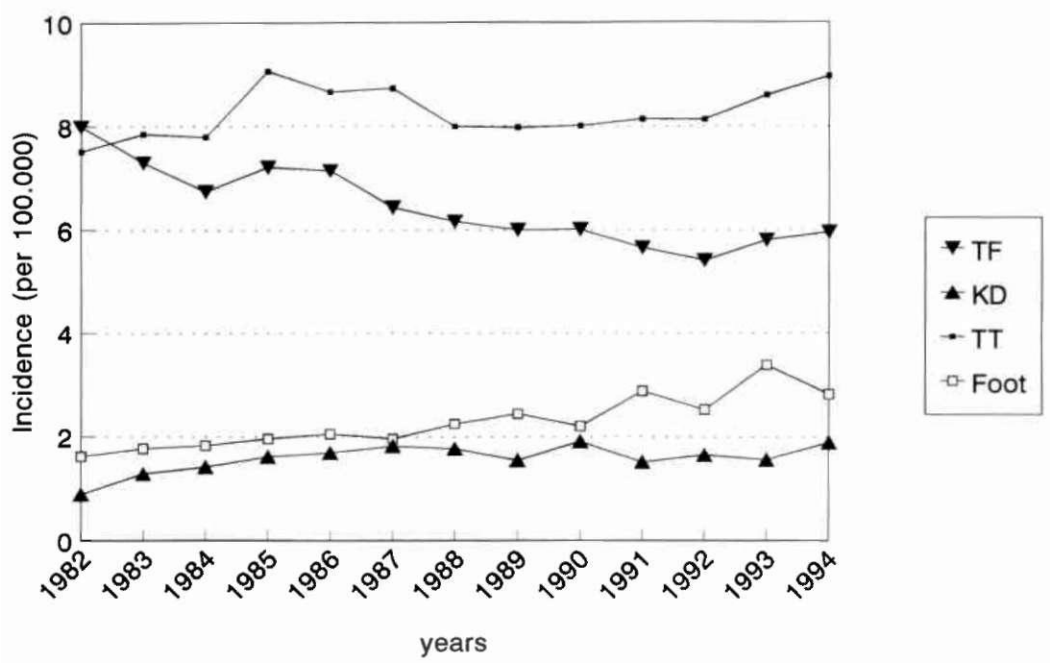
Data collected from the NMR in the North of the Netherlands showed a number of 409 amputations in the period 1991 -1992,

These included all TF, KD and TT amputations in the area registered by the hospital staff and collected by the NMR. These results are coded under NMR in Table 2.

Table 2. Comparisons between registered amputations by the NMR. and the observed amputations (OBS) in this study: 1991-1992. the north of the Netherlands

	NMR					OBS			
	TF	KD	TT	Total		TF	KD	TT	Total
1991	74	19	106	199		83	30	99	212
1992	79	21	1 10	210		82	26	128	236

TF: Trans-femoral; KD: Knee disarticulation; TT: Trans-tibial,



years

Fig 3. National data in the Netherlands 1982-1994 Incidence per year for the described amputation levels. TF = Trans-femoral; KD = Knee disarticulation; TT = Trans-tibial. Foot = transmalleolar to transmetatarsal

The 'observed' data (OBS) from this study showed a difference of (212-199)/212 = 6% compared to the NMR data over 1991. In 1992 there was a difference of (236-210)/236 = 11% between reported and actual number of amputations.

Comparing the individual amputation levels, differences appear more significant. For instance the difference between the number of performed KD and TT amputations between NMR and OBS data is remarkable.

Differences are approximately (3O-19)/30 = 36% for the number of KD amputations in 1991 between NMR and observed data. Differences between NMR and OBS are (128-110)/128 = 14% for the number of TT amputations in 1992.

It is thought that registration problems in the different hospitals are the cause of this difference. There is an overall difference of approximately 9% over the years 1991-1992.

Discussion

In this study the national data of lower limb amputations given by the NMR was compared with observed data over 1991-1992 in the north of the Netherlands. A control of this data is important since national data is used for policy making in the national health service and for study of the extent of certain diseases in the population.

The authors are certain that this study gives reliable results compared with the national data. It was shown that about 94% of all lower limb amputations are due to vascular pathology. This data is in accordance with data published by Ebskov (1992) of the Danish population. All 18 hospitals in the region participated in this study. All admitted patients with any kind of insurance are included in the study. Therefore there is a complete overview of data of the north of the Netherlands in the period 1991-1992.

In other studies (Dawson *et al,* 1995; Pohjolainen and Alaranta, 1988; Siitonen *et al,* 1993; Tunis *et al,* 1991; Wahlberg *et al,* 1994) only limited data is available or refers only to a single hospital. Apart from the data in this study only three studies (Alaranta *et al,* 1995; Jones, 1990; Pohjolainen and Alaranta, 1988) give an overview of all vascular, trauma and oncological amputations in the studied populations (Table 3). The other studies reported here only take into account the

Table 3. Studies published in literature over the last 10 years.

Population	Study period	Cause of amputation	Source (population size)	Incidence /100,000 in general population
Southern Finland Pohjolainen & Alaranta (1988) Alaranta *et al.* (1995)	1984-1985	VTO	hospital area (1.1 x 10*)	1984: 32.5 1985:28.1
Eastern Finland Siitonen *et al.* (1993)	1978-1984	V	local area (253,000)	men: 33.9 women: 17.3
Australian States Jones(1990	1981-1985	VTO	3 states	1984: 23 6
Maryland USA Tunis *etal.* (1991)	1979-1989	V	1 state	28-32
Sweden Wahlberg « a/. (1994)	1987-1992	V	hospital area (250,000)	1987: 26 1989:16
Switzerland Enzler(1994)	1979-1989	V	*'A* of national data (3.1 x 10°)	1979: 7.7 1989: 14
Denmark Eikhoff (1993)	1977-1990	V	national data (5.1 x 10*)	1977: 25.8 1983: 32.2 1990:23 1
Denmark Ebskov(1992)	1978-1990	V	national data (5.1 x 10*)	1978:30 1983: 34.5 1990: 25.0
The Netherlands Rommers *et al.*	1982-1993	VTO	national data (15.1 x 10*)	1982:18 1993 20

Cause of amputation: V = Vascular; T = Trauma; O = Oncology. Source: studied area and population at risk in the study. Incidence: number of amputations/ 100,000 in the studied area.

vascular group and even exclude the bilateral amputations (Hoogendoorn, 1988), or foot amputations (Ebskov *et al.*, 1994). In a number of studies adequate information about the amputation levels are not stated at all.

Some 4% of patient data was not complete due to incomplete medical notes or because clinical records were not available for detailed study.

During the research of medical notes it was found that most of the registration in the hospitals is done by administrative personnel. We found differences between the performed operation and the registration by the hospital. Mistakes were made in amputations in the foot region, where the different anatomical levels were mixed up. Another source of bias were the operations at TT and KD level. In several cases it was stated that an amputation of the lower limb was performed. A TT amputation was coded but the actual operation performed was a KD amputation. In the case of several surgical procedures during an admission, sometimes not all performed operations were stated in the discharge letter to the GP which is the main source of information for the registration of medical data.

The discharge destination as stated in this letter is coded for the NMR. The authors believe that the institution code as used by the NMR is more reliable than the use of the names of the individual institution because of the risk of confusion. In several cases institutions were inaccurately recorded and this is one of the causes for the errors in the information about discharge destination after surgery. Previously

the authors found (Rommers *et al,* 1996) that the actual admission frequency to the rehabilitation centre far exceeded the registered number of transferrals by the NMR to the rehabilitation centres in this territory.

The actual number of operations performed by the surgeons were calculated using calendar dates of the operations, whereas calculation of the NMR data was done at time of discharge. Small differences in number of amputation procedures can result from this, but will be equalised.

Information about the actual prescription of prostheses and the rehabilitation process is scarce in the Netherlands. Recent studies by Dawson *et al.* (1995) and Hoofwijk (1990) give some information, but this data was solely based on vascular amputees and only included a few hospitals. The actual prosthetic fitting rate of 48% in this study is in correspondence with Christensen (1995) and Eickhoff (1993). Dawson (1995) found 80% rate of prosthetic fitting in the surviving group, but only 54/81 = 66% of all patients involved actually received a prosthesis.

The actual place where the prosthesis is fitted and prosthetic training is given can be determined by regional differences. National data as gathered by the NMR about this issue is not available.

Parameters such as physical condition, social factors, age and co-morbidity are influencing factors in determining the discharge destination. Long term prosthetic use after discharge in a prospective cohort of patients is under study by the group and will be published in the future.

Studies of national data by Alaranta *et al.* (1995); Ebskov (1992); Ebskov *et al.* (1994); Eickhoff (1993) and Pohjolainen and Alaranta (1988) show a decrease in the incidence of lower limb amputations in Western Europe.

The Dutch national data shows a relatively constant incidence over the last 12 years. The Scandinavian authors (Ebskov, 1992; Ebskov *et al.,* 1994; Eickhoff, 1993; Pohjolainen and Alaranta, 1988) conclude that the increase in vascular reconstruction procedures is responsible for the decrease in lower limb amputations. Better control of diabetes in diabetic patients could have a positive contribution in this as well. The authors think that the influence of vascular surgery over the last 15 years in the Netherlands has gradually influenced the data and therefore did not show a sharp decrease as stated by the previously mentioned authors. It is difficult to compare data and incidence rates since not all authors state the precise amputation levels.

The total number of inhabitants in the studied areas is seldom given. This study gives low incidence rates, whilst counting all amputation levels in the lower limb. The authors agree with the LEA Study Group (1995) that standardisation is needed for comparable results in Western Europe and throughout the world.

The recorded number of lower limb amputees in the Netherlands of 2,000 per year (Central Bureau of Statistics, 1995; SIG Health Care Information, 1994) is not complete. The actual number of amputations is 3,000 (incidence of 20/100,000 x population) +8.5% (relative difference between NMR and OBS data) = 3,300 lower limb amputations from transpelvic to transmetatarsal level.

The influence of ageing of the population gives rise to much discussion about the near future. Figures given by the Central Bureau of Statistics (1995) indicate a 20% increase of people of 65 years and over from 1995-2015.

If the results in the north of the Netherlands are compared with the actual change of age distribution in the population, there is no evidence that increasing age in the population gave a higher incidence of amputation surgery of the lower limb in this region in the period 1982-1993.

Conclusions

National data of performed lower limb amputations in the Netherlands is reliable within certain limits. Registration in the hospitals for the NMR is done with care, but as is concluded from this study, it is incomplete, especially regarding individual amputation levels. The actual number of lower limb amputations is±60% higher than national published data. The re-amputation rate is about 17.5% in this area and is in line with previous results.

It was found in this study that 94% of the lower limb amputations in the region were due to vascular pathology, 3% because of trauma and 3% as a result of oncology.

Some 48% of the patients were fitted with a

prosthesis during their stay in hospital, nursing home or rehabilitation centre.

Incidence rates for lower limb amputations are about 18-20/ 100,000 over the last 12 years and show no sharp decrease in frequency as a result of vascular surgery as has been shown by other authors.

Amputation registration, discharge planning and prosthetic fitting give valuable information for the adequate treatment of the lower limb amputee.

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