

Lower Extremity Amputation in People with Diabetes as a Marker of Quality of Diabetes Care

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Received date: Jun 05, 2014, Accepted date: Jun 19, 2014, Published date: Jun 25, 2014

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Abstract

Diabetes is a common chronic disease, which can lead to a number of complications including lower extremity amputation (LEA). On-going management of diabetes requires the provision of good quality care. Assessing the quality of diabetes care is difficult. Measurement of quality has been described in terms of structures, processes and outcomes. This article focuses on the long-term clinical outcome of LEA, as an indicator of the quality of diabetes care.

Keywords: Diabetes; Amputation; Diabetes care; Healthcare

Abbreviations:

AHRQ: Agency for Healthcare, Research and Quality; CIHI: Canadian Institute for Health Information; LEA: Lower Extremity Amputation; MDT: Multidisciplinary Team; NHS: National Health Service; OECD: Organisation of Economic Co-ordination and Development

Introduction

Diabetes is a chronic disease, requiring lifelong management in order to avoid complications including lower extremity amputation (LEA). Quality of diabetes care emerged as an international concern in the 1980's. In 1989, health departments across Europe signed the St Vincent Declaration, an international endeavour to improve the quality of diabetes care [1]. The onus was placed on individual governments to develop strategies to meet agreed targets. Over the next decades, countries developed various programmes for diabetes management, including integrated care. In general, consensus exists on the principle of integrated care for diabetes management but opinions differ on how best to implement integrated care in practice [2].

Good quality care involves meeting and going beyond an acceptable level of performance by providing a safe and effective healthcare service. Improving quality of care is recognised as an essential element in the provision of effective healthcare. However, measuring and monitoring quality of care is complex and different approaches exist. One approach is to develop a set of specific indicators that would capture important performance aspects, be scientifically sound and be potentially feasible [3]. Indicators may be related to structures, processes, or outcomes of care [4]. International consensus does not exist as to which indicators should be used and various organisations around the world have developed sets of indicators to assess the quality of diabetes care. The Organisation of Economic Co-ordination

and Development (OECD) Quality Indicators Project recommend a set of nine quality indicators for diabetes care as outlined in Table 1.

Area	Indicator Name
Processes of diabetes care	Annual HbA1c testing Annual LDL cholesterol testing Annual screening for nephropathy Annual eye examination
Proximal Outcomes	HbA1c control LDL cholesterol control
Distal Outcomes	Lower-extremity amputation rates Kidney disease in persons with diabetes Cardiovascular mortality in patients with diabetes

Table 1: OECD Indicators of quality of diabetes care.

There is considerable overlap between the indicators chosen by many organisations including the OECD, the Agency for Healthcare, Research and Quality (AHRQ) in the US, the Australian Institute of Health and Welfare (AIHW), the Canadian Institute for Health Information (CIHI) and the National Health Service (NHS) in the UK [5-8]. All sets of indicators include LEA rates. Thus, LEA is recognised internationally as a marker of quality of diabetes care [3].

A LEA is a significant complication of diabetes that is costly to individuals economically, socially and psychologically. It is a potentially preventable complication [9]. A LEA can be major or minor depending on site of amputation. Although an international standardised definition is lacking, the definition that appears most frequently in recently published literature defines a major LEA as through or proximal to the ankle joint and a minor LEA as one distal to the ankle joint (Figure 1) [10,11].

An early minor LEA can prevent a later major LEA [12]. Thus, minor LEAs may reflect improved quality of care with earlier

intervention which consequently prevents the progression from minor to major LEA. For this reason and as the functional outcomes for major and minor LEAs differ markedly, it is prudent to examine major and minor LEA rates separately. Trends in major and minor as well as total LEA rates are increasingly recognised as informative and reflective of the quality of diabetes care.

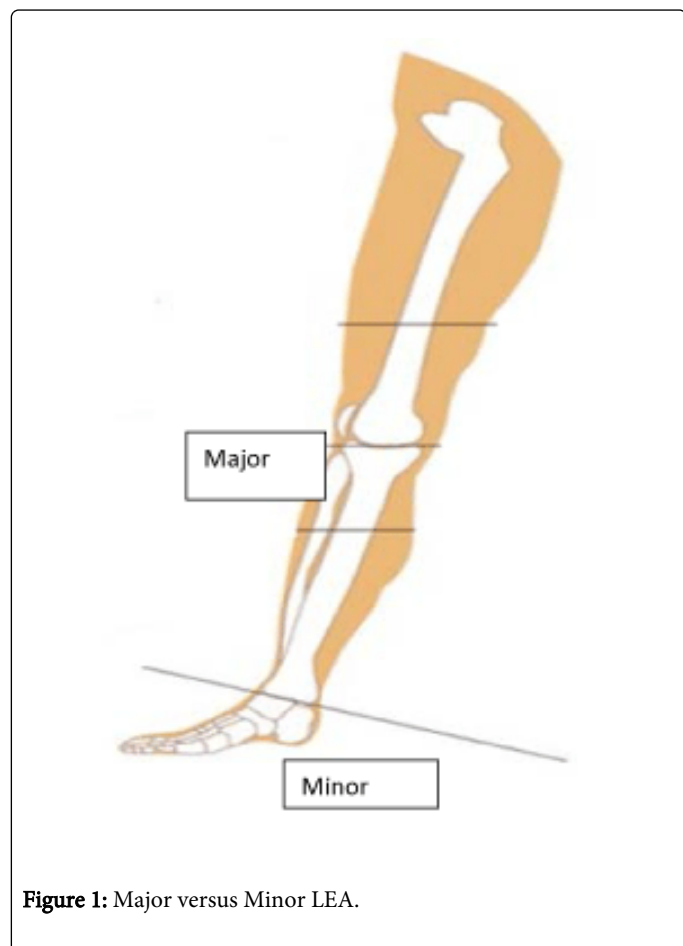


Figure 1: Major versus Minor LEA.

Measurement of LEA Rates in People with Diabetes

Many countries around the world have reported trends in LEA rates over time [10,13-15]. In 2011, a review of the global incidence of LEA in people with diabetes described a large variation in LEA rates in different populations [16]. LEA incidence rates are useful for comparison between countries, benchmarking against best practice and tracking of potential improvements [17]. All countries should be encouraged to record and analyse such data.

Different methods have been used to calculate incidence, with differing definitions of LEA and various numerators and denominators [18]. Authors need to be cognisant when using LEA rates for the purposes of benchmarking that results should be compared to data from studies of similar methodology. To calculate a LEA incidence rate, a numerator and denominator are needed. For the numerator, the number of amputees, amputations or admissions can be used [19]. Much debate occurs on the use of an appropriate denominator. Many authors advocate that LEA incidence rates are expressed per population with diabetes and per total population and are interpreted depending on the purpose of the information [11,18].

When incidence rates are only expressed in terms of the 'at risk' population, these figures are dependent on the prevalence of known diabetes. If the prevalence of diabetes is not well documented, the use of the total population in the denominator may be preferable. If a community adopts systematic screening for diabetes, diabetes will be diagnosed earlier in some patients and an increased number of patients who undergo LEA will be classified as being diabetes related. The increased effectiveness of such screening programmes may mask a decrease achieved by improvements in diabetes care. The value of expressing incidence in terms of the total population is useful for assessing the social and economic cost, while using the population 'at risk' as the denominator facilitates examination of the effectiveness of clinical care [18].

Worldwide, studies are demonstrating LEA risk reduction in people with diabetes with better organised care, including the establishment of multidisciplinary teams (MDTs) and structured care pathways and protocols [20,21]. There is a shift towards better organised care and trends in future LEA rates will hopefully reflect improved care and fewer LEAs for people with diabetes.

References

- [No authors listed] (1990) Diabetes care and research in Europe: the Saint Vincent declaration. *Diabet Med* 7: 360.
- Godlee F (2012) Integrated care is what we all want. *BMJ*: 344.
- Nicolucci A, Greenfield S, Mattke S (2006) Selecting indicators for the quality of diabetes care at the health systems level in OECD countries. *Int J Qual Health Care* 18 Suppl 1: 26-30.
- Campbell SM, Braspenning J, Hutchinson A, Marshall MN (2003) Research methods used in developing and applying quality indicators in primary care. *BMJ* 326: 816-819.
- Australian Institute of Health and Welfare (2009) National indicators for monitoring diabetes. Australian Institute of Health and Welfare., in Report of the Diabetes Indicators Review Subcommittee of the National Diabetes Data Working Group, A.I.o.H.a. Welfare., Editor 2007. p. 114.
- Hussey P, Mattke S, Morse L, Ridgely MS (2007) Evaluation of the use of AHRQ and other quality indicators. Prepared for the Agency for Healthcare Research and Quality 2007.
- Majumdar SR, Jeffrey A, Johnson JAJ, Bowker SL, Booth GL, Dolovich L, et al. (2005) A Canadian consensus for the standardized evaluation of quality improvement interventions in type 2 diabetes. *Canadian Journal of Diabetes*: 220-229.
- National Health Service. List of Indicators. Health and Social Care Information Centre. National Health Service, UK.
- Singh N, Armstrong DG, Lipsky BA (2005) Preventing foot ulcers in patients with diabetes. *JAMA* 293: 217-228.
- Vamos EP, Bottle A, Edmonds ME, Valabhji J, Majeed A, et al. (2010) Changes in the incidence of lower extremity amputations in individuals with and without diabetes in England between 2004 and 2008. *Diabetes Care* 33: 2592-2597.
- Kennon B, Leese GP, Cochrane L, Colhoun H, Wild S, et al. (2012) Reduced incidence of lower-extremity amputations in people with diabetes in Scotland: a nationwide study. *Diabetes Care* 35: 2588-2590.
- Tseng CL, Rajan M, Miller DR, Lafrance JP, Pogach L (2011) Trends in Initial Lower Extremity Amputation Rates Among Veterans Health Administration Health Care System Users From 2000 to 2004. *Diabetes Care*: 1157-1163.
- Jeffcoate WJ, Margolis DJ (2012) Incidence of major amputation for diabetes in Scotland sets a target for us all. *Diabetes Care* 35: 2419-2420.
- Buckley CM, O'Farrell A, Canavan RJ, Lynch AD, De La Harpe DV, et al. (2012) Trends in the incidence of lower extremity amputations in people with and without diabetes over a five-year period in the Republic of Ireland. *PLoS One* 7: e41492.

15. Ikonen TS, Sund R, Venermo M, Winell K (2010) Fewer major amputations among individuals with diabetes in Finland in 1997-2007: a population-based study. *Diabetes Care* 33: 2598-2603.
16. Moxey PW, Gogalniceanu P, Hinchliffe RJ, Loftus IM, Jones KJ, et al. (2011) Lower extremity amputations--a review of global variability in incidence. *Diabet Med* 28: 1144-1153.
17. Leese GP, Wild SH, Edmonds ME (2011) Variation in practice: a useful measure or not? Looking at amputations and diabetes care. *Practical Diabetes International*: 7-8.
18. Jeffcoate WJ, van Houtum WH (2004) Amputation as a marker of the quality of foot care in diabetes. *Diabetologia* 47: 2051-2058.
19. van Houtum WH (2008) Amputations and ulceration; pitfalls in assessing incidence. *Diabetes Metab Res Rev* 24 Suppl 1: S14-18.
20. Krishnan S, Nash F, Baker N, Fowler D, Rayman G (2008) Reduction in diabetic amputations over 11 years in a defined U.K. population: benefits of multidisciplinary team work and continuous prospective audit. *Diabetes Care* 31: 99-101.
21. Driver VR, Madsen J, Goodman RA (2005) Reducing amputation rates in patients with diabetes at a military medical center: the limb preservation service model. *Diabetes Care* 28: 248-253.

This article was originally published in a special issue, entitled: "**Diabetic Foot infections: Treatment & Cure**", Edited by Prof. José Luis Lázaro Martínez University of Madrid, Spain and Jake P. Heiney University of California, USA