Incidence of Major Amputation for Diabetes in Scotland Sets a Target for Us All

In this issue, Kennon et al. (1) report the incidence of amputation in diabetes across Scotland. Their findings are expressed both in terms of the total population (which is primarily a measure of national disease burden and much influenced by the changing prevalence of diagnosed diabetes) and the population with diabetes: the "at risk" population. The advantage of expressing amputation in terms of those at risk is that the results can be used as an indication of the quality of disease management, even though the data require careful interpretation (2). Unfortunately, it is not possible to calculate incidence in the population at risk without reliable information on the prevalence of diabetes in the community or country being studied, and such information is rarely available. The study by Kennon et al. (1) is, therefore, a tribute to those who created the Scottish Care Information–Diabetes Collaboration (SCI-DC) (3). However, if a reliable national database of diabetes does not exist, other—potentially less reliable—approaches must be used, including *1*) hospital discharge coding, which has traditionally been flawed by underrecording of diabetes but is improving with increased awareness of the contribution made by diabetes to the disease burden of all nations, and 2) the study of particular communities, with populations selected by health care provider or insurance/reimbursement scheme (Medicare, Veterans Health Administration [VHA], etc.) or by locality (4–7). By use of the SCI-DC database, Kennon et al. (1) report that the incidence of major amputation in people with known diabetes in Scotland fell by >40% between 2004 and 2008 to 1.1/1,000 person-years. This figure is reassuringly similar to those derived from hospital episode statistics in National Health Service hospitals in England, where the reported incidence was 1.02/1,000 person-years in 2008 (8) and the average incidence between 2007 and 2010 was 0.99 (9).

There is no equivalent nationwide information reported from other developed countries, and available data are derived from particular patient groups. Thus, the incidence of major amputation affecting patients in the VHA in 2004 was 1.59/1,000 person-years (10), even though the population selected was restricted to those undergoing their first lower-limb amputation. This figure might reflect the higher prevalence of social deprivation (as defined by mental illness, poor education, or socioeconomic status) in VHA patients, as well as the fact that they are almost exclusively male and that male sex is known to confer an increased risk of amputation. The incidence was 1.7/1,000 person-years in an unselected population from the catchment area of Karolinska Solna Hospital, Stockholm, Sweden, in 2006 (7), while it was 2.4/1,000 person-years in Trondheim, Norway, in 2004–2007 (6). These data were derived from more urban populations, and it should be noted that the Scottish group earlier reported that the incidence of major amputation in Dundee in 2006 was as high as 2.9/1,000 person-years (11), possibly reflecting either an influence of greater social deprivation in city dwellers or variation in data-collection methodology. Despite this, it should be noted that two other U.K. groups have reported much lower incidences of major amputation in unselected, mixed urban and rural populations: 0.76/1,000 person-years (4) and 0.67/1,000 person-years (5). The variation in incidence of both major and total amputations between different parts of England was recently reported to be up to 10-fold (9,12). Wrobel, Mayfield, and Reiber (13) reported 8.6-fold variation between Medicare beneficiaries in the U.S. in 1996–1997, although this fell to sixfold in 2006–2008 (14).

There are many factors that may account for such apparent variation. The impact of social deprivation on the incidence of both foot ulcer and amputation is well recognized (15), but social deprivation in developed countries needs to be distinguished from the influence of race, which is also well described. It is relevant that the incidence of major amputation is higher in African Americans in the U.S. (16) and that this is in contrast to black males living in London, among whom the incidence is one-third that of Caucasians (17). It is possible that the higher incidence in African Americans relates more to social deprivation and to variable access to medical care in the U.S. (18) than to race per se. It is relevant that with the exception of Asians (in whom the risk of both ulcers and amputations is lower), the incidence of amputation (major plus minor) in ethnic minorities in the Medicare population in the U.S. was found to be up to double that of whites, even though the incidence of new ulcers was virtually identical (19). This can only indicate that ulcer outcome is worse—for whatever reason—in some ethnic minority groups, which contrasts with observations made in participants selected for clinical trials, in whom the rate of healing of neuropathic ulcers has been shown to be greater in nonwhites than in whites (20).

The preferences, attitudes, beliefs, and mood and, hence, the behavior of the patient are obviously important, but there is one more factor that must be seriously considered to be contributory to the differences in incidences of amputation both within developed countries and between them: the training and beliefs of professionals. Connelly, Airey, and Chell (21) produced evidence to suggest that fourfold variation in the incidence of amputation between centers in England could be attributed, at least in part, to the opinions of the surgeons concerned. It has also been shown that there is a correlation between parts of England that have a high incidence of major amputation with those that have a high incidence of minor amputation (both in people with diabetes and without), suggesting geographical variation in the readiness with which surgical intervention is considered (9). Considerable variation has also been observed in the use of minor amputation between different expert centers in Europe (22). In the U.S., there is variation throughout the VHA system (23), and Margolis and colleagues used Medicare data to demonstrate clustering of centers with higher incidences of amputation and concluded that this may reflect specialists who share common training and, hence, similar approaches to management (14).

The importance of professional opinion and performance is also demonstrated by the many centers worldwide that have shown that the creation of specialist services, and particularly of multidisciplinary team working, leads to a prompt and sometimes marked (4,5) reduction in the incidence of amputation. One way in which multidisciplinary team working is beneficial is that it will attract rapid referral, and there is evidence that the rate of healing correlates inversely with ulcer duration at first specialist assessment (24,25). Another explanation for the beneficial effect of team working may be the moderating influence of interdisciplinary discussion.

Whatever the reasons, and these will vary between countries and cultures, it is essential that the issue of variation remain under close scrutiny, and although there will always be individuals for whom early major amputation is the correct treatment, reduction in variation should eventually lead to a reduction in the overall incidence of major amputation. The incidence should probably be of the order of 1.0/1,000 person-years in countries with comprehensive health care, as reported in this important study by Kennon et al. (1), or even less.

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