

Chapter 5

Diabetes and Lower Limb Amputations in Alberta



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DIABETES AND LOWER LIMB AMPUTATIONS IN ALBERTA

KEY MESSAGES

- People with diabetes were 12 to 18 times more likely to have a lower limb amputation than people without diabetes.
- Younger adults with diabetes have significantly higher rates of lower limb amputation than their non-diabetic counterparts, compared to the oldest age groups.
- In people with diabetes, lower limb amputation is more common in the northern regions of Alberta compared to the southern regions.

BACKGROUND

Atherosclerotic peripheral arterial disease (PAD) and diabetic peripheral neuropathy (DPN) are serious complications of diabetes and can sometimes lead to lower limb problems (e.g., foot ulcers and amputations).⁽¹⁾ In people with diabetes, foot ulceration is usually a consequence of either; 1) impaired sensation which increases the risk of trauma, or 2) poor blood flow to the injured area which interferes with the healing process. Commonly both factors operate together. Susceptibility to injury and poor wound healing can lead to ulceration and unless treated promptly, foot ulcers may become infected particularly when diabetes control is poor. Soft tissue infection may progress to involve the underlying bone. These deeper infections are usually very difficult to treat and may require amputation. Similarly, when the extremities of the body are deprived of oxygen due to PAD, tissue death may result, leading to ulceration and/or gangrene. If revascularization is not possible and gangrene develops, amputation will usually be required. Lower limb problems are a major cause of morbidity and mortality in people with diabetes and contribute to increased healthcare costs.^(2,3) Ulcers and amputations can be prevented by good foot care and prompt treatment of ulcers that are at their initial stage.⁽²⁾

Besides increased health care costs, people who have foot ulcers and/or lower limb amputations have a decreased health-related quality of life.^(4,5) These individuals often have long treatment periods that can be both painful and time consuming with much time spent on clinic visits, hospitalization and frequent foot ulcer dressing changes with or without long term antibiotic therapy.⁽⁵⁾ If a lower limb amputation results, patients are faced with many challenges such as needing assistance with activities of daily life.

METHODS

Data from Alberta Health and Wellness (AHW) Physician Claims databases were utilized for these analyses. This dataset captures Alberta resident demographic information, and lower limb amputations with accompanying diagnostic information. Although there are other indicators of advanced PAD, such as foot ulceration and lower limb revascularization (e.g., peripheral angioplasty), we focused on lower limb amputations as a marker of DPN and/or end-stage of PAD in people with diabetes. We excluded lower limb amputations due to trauma and other specific causes, to focus our surveillance on amputations likely due to DPN and PAD (see Appendix for these codes). All adult residents of Alberta aged 20 years or greater were included in these analyses.

From these data, rates of lower limb amputation for those with and without diabetes were calculated. For each group, the number of people with amputations (numerator) was divided by the number of people in the province or region (denominator), respectively. Trends over time (1995-2005), as well as regional and age-specific rates for amputation were calculated. Persons with diabetes were identified as described in the Methods chapter. Due to the relatively low case counts for lower limb amputations within regions, we were unable to adjust for age and sex differences and therefore present only the case counts and crude rates in these findings.

FINDINGS

Lower limb amputation is a complication in people with diabetes that is rare in people without diabetes. During the past decade, people with diabetes were 12 to 18 times more likely to have a lower limb amputation than people without diabetes, after adjusting for age and sex (Figure 5.1). Amputation rates decreased over the years, however the ratio between those with and without diabetes remained constant. Lower limb amputation was about twice as common in males with diabetes than in females with diabetes (Figure 5.2).

Figure 5.1 Age and Sex-Adjusted Lower Limb Amputation Rates, 1995-2005

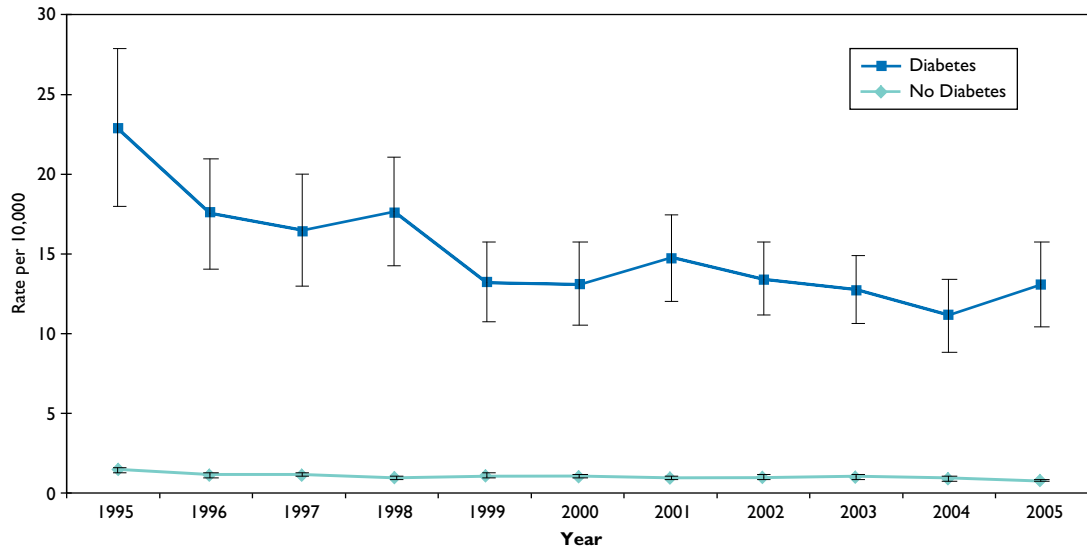
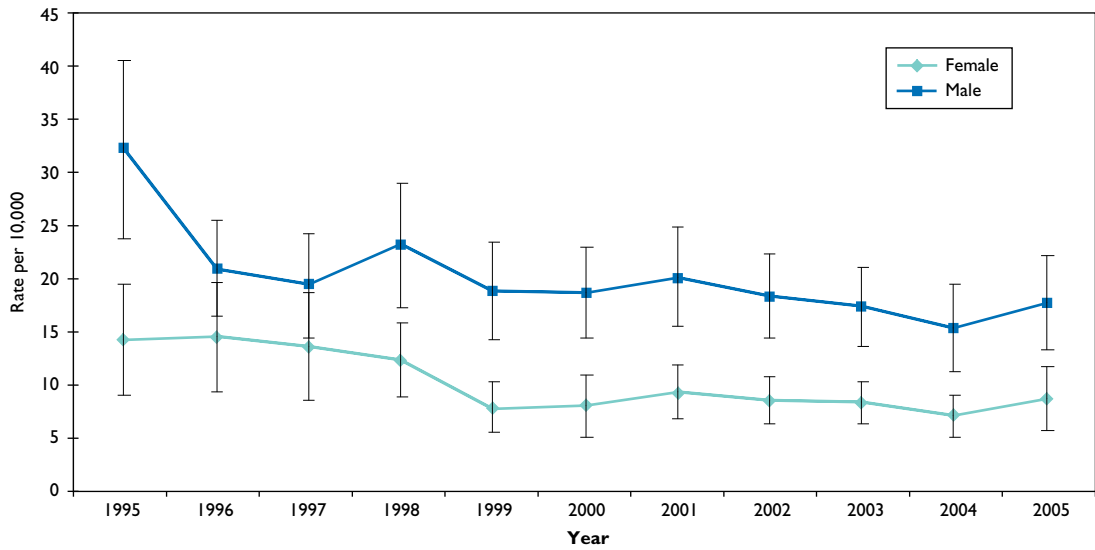
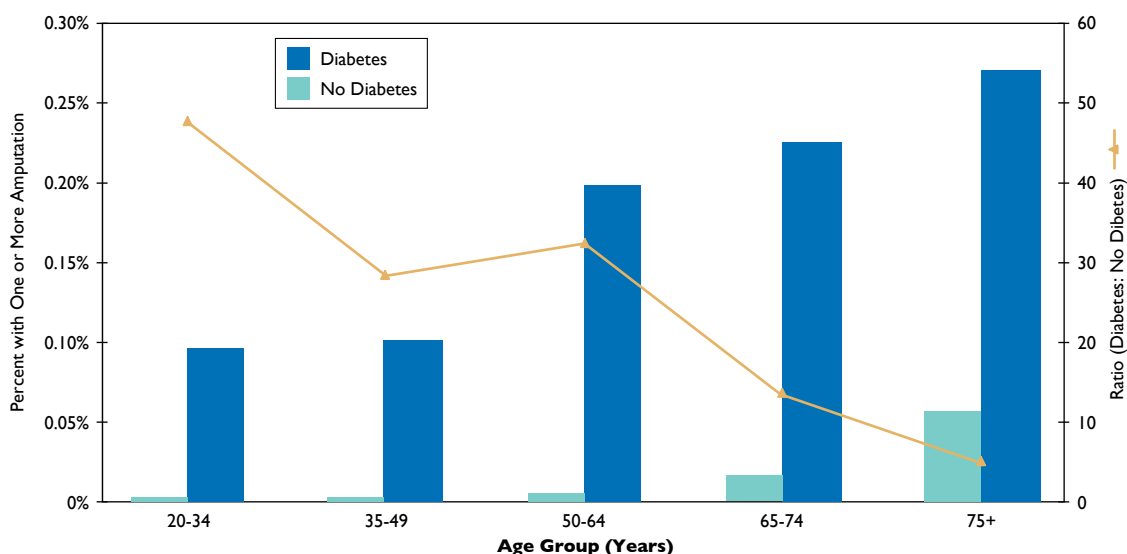


Figure 5.2 Age-Adjusted Lower Limb Amputation Rates for Males and Females with Diabetes, 1995 to 2005



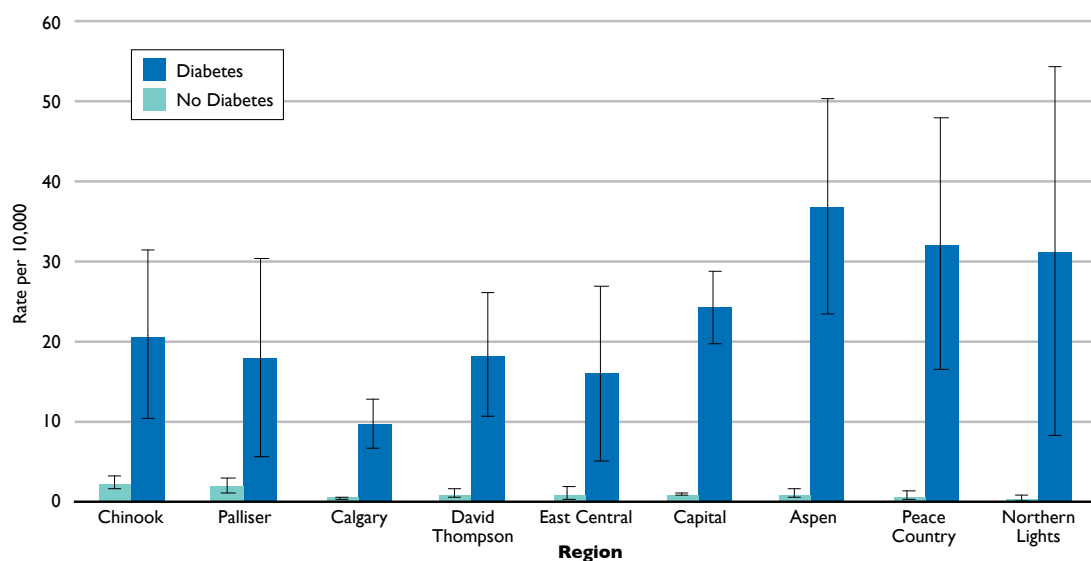
Lower limb amputation is not common in young people without diabetes but becomes more common in older adults with and without diabetes (Figure 5.3). The rate ratio (or relative risk) demonstrates that the risk of lower limb amputation is much greater for adults with diabetes compared to those without diabetes. While there are more lower limb amputations in older patients, the relative risk of lower limb amputation is much higher in younger adults with diabetes compared to older adults. In fact, in the youngest age group of 20-34 years, those with diabetes are 48 times more likely to have a lower limb amputation than those without diabetes. In the age group 75 years and older, those with diabetes are only 5 times more likely to have a lower limb amputation than those without diabetes. The higher rate of amputation in older people is likely due to increased PAD in both groups. The excess of lower limb amputations in younger adults with diabetes is likely due to an excess of peripheral neuropathy rather than PAD alone.

Figure 5.3 Age-Specific Lower Limb Amputation Rates, 2005



There appears to be a north to south gradient in the rate of lower limb amputations among those with diabetes in Alberta (Figure 5.4). Those with diabetes who live in the Capital region and further north are all above the provincial average of 19.6 lower limb amputations per 10,000 persons in 2005.

Figure 5.4 Crude Lower Limb Amputation Rate by Region, 2005



DISCUSSION

Foot ulcers and lower limb amputations cause a significant amount of morbidity in people with diabetes. The above findings stress the need for life-long surveillance of the diabetic foot at risk and the necessity of preventive foot care among diabetic patients.⁽³⁾ Although the absolute numbers of people with diabetes that ultimately receive amputations are relatively small, the burden that lower limb amputation places on patients is very large. Also, due to the preventable nature of this complication, diabetic foot care is a very important aspect of the management of diabetes in Alberta. The rate of lower limb amputations has been suggested as an indicator of overall quality of care for diabetes.⁽⁶⁾

As previously noted, foot ulcers and lower limb amputations are a result of two different processes in people with diabetes. Decreased sensation due to diabetic peripheral neuropathy (nerve damage) makes it hard for people with diabetes to feel small cuts or damage to the foot; and poor blood flow to the legs and feet (peripheral arterial disease) prevents healing of these small cuts, allowing them to worsen. Diabetes itself, particularly if poorly controlled, increases the risk of ulcers becoming infected. Reducing the risk of lower limb amputations therefore requires multiple prevention strategies, including regular foot checks by the person with diabetes themselves, as well as by their health care providers.⁽²⁾

Poor blood circulation in the lower limbs is due to atherosclerosis, the same disease process that affects blood vessels of the heart (leading to heart attacks) and the brain (leading to stroke).^(7,8) Atherosclerosis refers to the build up of cholesterol in the arteries, which over time leads to the narrowing of blood vessels that impairs blood supply. Reducing the risk of lower limb amputation therefore requires the same preventative treatment. Treatment includes cholesterol lowering, blood pressure lowering, anti-platelet (ASA) therapy and revascularization similar to that used to prevent and treat heart attacks and strokes.

Unfortunately, there is evidence to suggest that people with diabetes and PAD are not optimally treated to reduce their risk of heart attacks or stroke.⁽⁹⁻¹¹⁾ Notably, lower limb amputation could be thought of as the “tip of the iceberg”, as it is a marker for end stages of DPN and PAD. There are a great deal many more patients with less severe (but still serious) forms of the disease who would benefit from better preventive therapies.

It is encouraging to see a steady reduction in the rate of lower limb amputations for Albertans with diabetes over the past decade. However, like other complications in people with diabetes, we observed considerable variation in the rate of lower limb amputations across the health regions of Alberta. It is not known why those living in central and northern Alberta have higher rates of lower limb amputation. Differences in these rates may reflect different levels of risk for people with diabetes in the regions, different use of preventive foot checks or risk-reducing drug therapy, access to health care providers, delay in seeking medical attention or in treating ulcers, or differences in the decision-making to undergo an amputation. As with many other trends observed in this **Alberta Diabetes Atlas**, further investigation is needed to better understand the reasons for the patterns, which may in turn lead to improvements in regional patient care.

References

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APPENDIX

Lower Limb Amputation

Alberta Physician Claims data were used for these analyses. Every procedure is paired with a diagnostic code in the administrative databases; therefore any procedure code with one of the below diagnostic codes was excluded in order to focus our surveillance on amputations likely due to diabetic peripheral neuropathy and peripheral arterial disease.

Diagnosis	Procedure Code	Description
Lower Limb Amputation	96.11A	Amputation and disarticulation of one toe
	96.12A	Amputation and disarticulation of foot: Metatarsal- whole ray
	96.12B	Amputation and disarticulation of foot: Transmetatarsal
	96.13	Amputation and disarticulation of ankle: Symes, Pirogoff
	96.14	Amputation of lower leg below knee
	96.15	Amputation of thigh or disarticulation of knee: Supracondylar Thigh through femur

Excluded Diagnostic Codes	ICD-9-CM	Description
	170	Malignant bone tumor
	171	Malignant connective tissue tumor
	213	Benign neoplasm of bone
	730	Osteomyelitis
	740-759	Congenital abnormalities
	800-900	Trauma
	901-904	Arterial Injury
	940-950	Burns