A SASKATCHEWAN PERSPECTIVE

The Saskatchewan Lower Extremity Wound Pathway: A Missed Opportunity

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Abstract: In 2013, the Lower Extremity Wound Pathway (LEWP) was one of two provincial pathways initiated in Saskatchewan (Canada) to standardize patient care and remove surgical bottlenecks. The multidisciplinary pathway was led by vascular surgery and family medicine. The result of the pathway was a significant increase in wound referrals to vascular surgery, with a trend towards decreased major limb amputation. However, this led to increased demand in one tertiary hospital in Saskatoon, ultimately overwhelming local hospital resources and leading to suspension of the pathway.

Key words: *lower extremity wounds, amputation, Saskatchewan, standardized care.*

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In 2013, government and health-care leaders in the province of Saskatchewan were invited to assess potential pathways for a combination of patient impact and system readiness. Acute stroke and lower extremity wounds were selected. The Lower Extremity Wound Pathway (LWEP) was co-led by representatives from Vascular Surgery and Family Medicine. The goal was to prevent wounds by identifying and treating pre-wound conditions and to standardize assessment and treatment of wounds. This would be facilitated by utilizing primary providers, regional surgeons and home care teams.

Needs Assessment

In Saskatchewan, 60% of leg amputations are for diabetic wounds (CIHI). Most amputations are preceded by a diabetic foot ulcer. Many patients who undergo major lower extremity amputation will have the contralateral limb amputated within the next five years. In Saskatchewan, referral patterns were different between two tertiary cen-

tres, one in Regina and the other in Saskatoon. In Saskatoon, most diabetic foot ulcers, swollen legs, stasis ulcers and even cellulitis, were referred to vascular surgeons. In Regina, lower extremity wounds were assessed by a variety of specialists.

Challenges

Wound care patients are complex with diverse needs. Outpatient management may require assessment of perfusion, revascularization, and serial debridement. Vascular surgeons can address all these needs. Patient access to outpatient appointments may be a challenge. Ambulatory care space and operating room time are limited. Podiatry was defunded by Saskatchewan Health, resulting in decreased access to a valuable resource in the community.

Implementation

We had hoped to distribute wound care across the province to improve patient experience and decrease the incidence of complex wounds. Advanced care nursing would be able to offer debridement and limit travel for patients. However, regional centres in Saskatchewan may be small, with regions having a population as low as 3,000 to 6,000. Advanced NSWOC nursing coverage is variable, with a small number of local experts. As well, some 36,000 Indigenous people live in the far north of Saskatchewan, half on reserve. This group is at risk, but lacks access to local services. An ideal tertiary wound centre would provide "one stop" access to a surgeon, with further care to be delivered in the community, but would also have a patient navigator, home IV support, access to offloading devices, total contact casting, debridement and minor procedures in one location.

The goal was to build capacity among care providers. A Saskatchewan Polytechnic course for *Care of the Patient with Lower Extremity Wounds* was started. The goal was to improve comfort for home care nursing. There was an accredited online course for physicians. However, despite best efforts, internal polling showed only half of family physicians were aware of the LEWP.

The vascular surgery-led wound pathway did not obtain new resources to improve care or accommodate the increasing volume of patients. Care essentially remained a vascular surgeon offering foot debridement and minor amputation in ambulatory care and admission for revascularization, care of complex wounds and major amputation. While advanced NSWOC Registered Nurses were part of the team, they were not physically dedicated to the outpatient clinic, covering both other hospital services and a heavy in-patient volume as well.

The LEWP put out management algorithms. The goal was to standardize and improve care in the community. LEWP algorithms attempted to include best evidence where available. Challenges occurred with dogma, such as requiring an ankle brachial index prior to compression, even where 'clearly palpable pulses' existed. In these cases, significant resources went into testing ABI. This led to an increase in unnecessary outpatient referrals to vascular surgery, where no question about perfusion existed. Vascular surgery also received lower extremity referrals outside the scope of the LEWP, where primary providers were uncertain which service would manage undifferentiated or vague leg complaints.

In Regina, there is a lower wound volume, and a more balanced care model without implementation of the LEWP. Regional centres and surgeons are more involved, while distributed care is less standardized.

In Saskatoon, St Paul's Hospital represents one high-volume wound centre for the northern half of Saskatchewan. Initially, approximately 2,000 to 3,000 annual unique out-patient visits were seen in ambulatory care. By 2022, this number increased to 5,154 total ambulatory care out-patient encounters, including 809 new patients. Approximately 15% of these appointments led to admission, on par with guidance from other high volume Canadian wound centres. The total number of admissions for vascular patients, including wounds, has declined in the past two years. However, the increased use of resources after LEWP implementation affected access to ambulatory care, in-patient beds and OR times for other

Table 1. Amputation volume of Vascular Division, by year during initial decade of LEWP implementation

Year	Above Knee Amputation	Below Knee Amputation	Partial foot or toe amputation
2013	31	41	139
2014	37	37	144
2015	43	54	148
2016	41	39	143
2017	25	29	162
2018	22	38	167
2019	29	38	165
2020	16	49	185
2021	14	31	231
2022	18	38	223

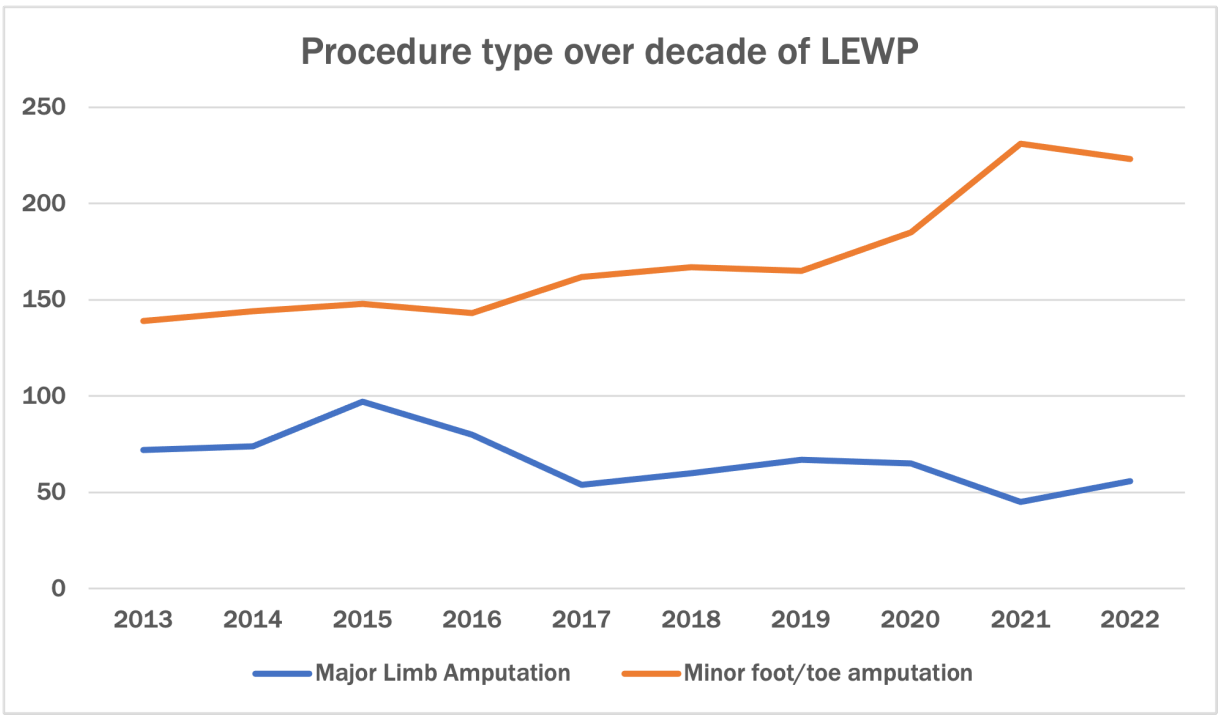
Source: Authors' notes

services. This led to criticism by colleagues and, ultimately, administration.

The number of lower limb amputations was taken from office EMR billing data, which may miss some procedures, in particular minor procedures, that may not have been billed. It is not possible to provide statistical analysis, given a lack of a robust database.

The above knee amputation rate peaked at 43 in 2015, presumably due to an initial increase in referrals to vascular surgery. Above knee amputations decreased to 14 in 2021, despite vascular surgery seeing a greater number of

Table 2. Procedure type over decade of LEWP



Source: Authors' notes

patients with lower extremity wounds. The rate of below knee amputation seemed stable but may have a downward trend. It appears that combined above and below knee amputations (major limb amputations) declined over time despite an increased patient volume. Minor limb amputations (trans metatarsal, toe and ray amputations) increased from 139 in 2013 to 231 in 2021. (See Tables 1 and 2.)

Conclusion

Limb preservation is resource intensive. There is no one solution to improve care. In the case of the LEWP, a high volume, single centre model may decrease major limb amputation, with an increase in wound patient volume and minor procedures like toe amputation. The LEWP failed at keeping wound care in the community, increasing wound referrals to a tertiary vascular centre as awareness increased. This model faced unanticipated resistance due to its effect on other services.

With the loss of administrative support, the Lower Extremity Wound Pathway was suspended in 2022. Complex wound referrals in the setting of clearly palpable pedal pulses are now referred to regional orthopedics, where a service exists. Further analysis may be needed to see if improvements in major limb amputation rates are preserved. ■

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