Point prevalence of complex wounds in a defined United Kingdom population

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ABSTRACT

Complex wounds (superficial-, partial-, or full-thickness skin loss wounds healing by secondary intention) are common; however, there is a lack of high-quality, contemporary epidemiological data. This paper presents point prevalence estimates for complex wounds overall as well as for individual types. A multiservice, cross-sectional survey was undertaken across a United Kingdom city (Leeds, population 751,485) during 2 weeks in spring of 2011. The mean age of people with complex wounds was approximately 70 years, standard deviation 19.41. The point prevalence of complex wounds was 1.47 per 1,000 of the population, 95% confidence interval 1.38 to 1.56. While pressure ulcers and leg ulcers were the most frequent, one in five people in the sample population had a less common wound type. Surveys confined to people with specific types of wound would underestimate the overall impact of complex wounds on the population and health care resources.

Most wounds, such as acute surgical wounds, heal uneventfully by primary intention (wound margins brought together and secured). However, some wounds are open and heal from the “bottom up” and are commonly referred to as chronic or complex wounds. Complex wounds can be defined as superficial-, partial-, or full-thickness skin loss wounds healing by secondary intention. These wounds comprise leg ulcers and pressure ulcers as well as foot ulcers and surgical wounds healing by secondary intention including dehisced wounds.

The organization of wound care varies around the world. In the United Kingdom (UK), most management of people with complex wounds occurs in the community and is delivered primarily by nurses with a range of other health professionals also involved in prevention and treatment including tissue viability nurses, dermatologists, vascular surgeons, podiatrists, physiotherapists, and occupational therapists. The prevention and management of complex wounds have a considerable impact on health care resources. Accurate cost data are scarce but venous leg ulcers alone have been estimated to cost between £300 and £600 million per year in health expenditure.1 Data on the detrimental impact of complex wounds on patients’ quality of life are also accumulating.2,3

High-quality epidemiological data are vital in helping health care providers understand the extent of the condition, the characteristics of people with the condition, and how to best plan health care services. However, previous prevalence studies of complex wounds are characterized by deficiencies in their design and reporting.4,5 Commonly, studies are surveys confined to people with specific wound types, e.g., leg ulcers or pressure ulcers rather than people with all kinds of complex wounds. This fragmentation of the epidemiological picture results in a limited understanding of the impact on services and communities of complex wounds as a whole.6 Existing research is also characterized by a wide variation in definitions (or none),4,6,7 limitations in survey populations such as age (e.g., restricted to elderly people4,8) or care settings (e.g., survey of nursing services only4), and differences in the denominator population used to calculate estimates of prevalence (e.g., caseload rather than geographical population).9 All these factors affect the validity of the estimates and make interpretation and comparison of findings problematic. Consequently, we have an incomplete understanding of the extent and nature of people with complex wounds and there is an urgent need for high-quality epidemiological data. The authors were about to embark on a new in-depth program of research into complex wounds in a UK city and required a baseline estimate of overall prevalence and description of the characteristics of care that were not available from any other source.10

The overall aim of this research was to investigate the number, nature, and care of people with complex wounds in a northern UK city (Leeds, population 751,485). Our specific objectives were to estimate the point prevalence of people...
with complex wounds and the point prevalence of people with each type of complex wound, and to explore the relationship between complex wounds and gender, age, and comorbidity.

**MATERIALS AND METHODS**

**Study design**

This was a cross-sectional point prevalence survey that estimated the distribution of people with complex wounds in the population of Leeds, UK. Case ascertainment by care providers was used to identify patients with a current complex wound. This method has been used in a number of studies of complex wounds.\(^9\),\(^10\),\(^14\) All care provider organizations in Leeds took part in the survey: National Health Service (NHS) community and primary care services (1 community trust, 1 primary care trust, 113 general practices), NHS mental health services (1 trust), NHS acute services (1 trust), independent hospitals (\(n = 3\)), prisons (\(n = 2\)), nursing homes (\(n = 46\)), and hospices (\(n = 2\)). Ethics approval for the survey was obtained from an NHS Research Ethics Committee.\(^15\)

**Definitions**

A complex wound was defined as “superficial-, partial- or full-thickness skin loss wounds healing by secondary intention.” The definitions used for individual types of complex wound are shown in Table 1. Existing definitions in the literature were used where possible. If none was available, we developed one for the purpose of the study. We classified the severity of each wound using the definitions in current use in Leeds (see Table 2).

**Data collection procedure**

Preparations with health care providers in Leeds began up to 12 months in advance to optimize participation and completion of the wound assessment form. A data coordinator, based in the NHS, acted as the main point of contact and liaison with care providers. Preparations included the following: educational sessions that linked into existing events such as professional or team meetings and scheduled NHS training events within the city; publicity in citywide NHS newsletters and bulletins; in the days immediately prior to data collection, all care providers were contacted, either by e-mail or telephone to remind them about the survey; and project team members were available during the 2-week survey to answer queries and provide further information and support.

A pilot study of the wound assessment form and guidelines was undertaken with care providers from a range of care settings and professions. Minor changes were made in the light of feedback received such as moving questions to a more appropriate section of the wound assessment form and providing additional response options for some questions.

Data collection took place over 2 weeks from February 28 to March 13, 2011. Care providers completed a wound assessment form (Table 3) for every patient with a complex wound on their caseload using information from sources of routine data e.g., case notes or electronic patient records. Data were collected for all participants regardless of age. Duplicates were avoided by care providers only completing one form per patient.

**Table 1. Complex wound definitions**

| Complex wound                                                                 |  |
|--------------------------------------------------------------------------------|---|
| Superficial-, partial-, or full-thickness skin loss and healing by secondary intention. |  |
| **Diabetic foot ulcer**                                                       | Any open wound present on the foot below the level of the ankle, in a person **with** diabetes. |
| **Nondiabetic foot ulcer**                                                    | Any open wound present on the foot below the level of the ankle, in a person **without** diabetes. |
| **Leg ulcer**                                                                | An area of discontinuity of epidermis and dermis on the lower leg, persisting for 4 weeks or more. May be due to venous disease or arterial disease alone, or a combination of both.
| **Pressure ulcer**                                                           | Localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure or pressure in combination with shear. |
| **Dehisced surgical wound**                                                   | A surgically closed wound (e.g., sutured) that has broken open because of, for example, infection or poor healing. |
| **Pilonidal sinus**                                                          | A sinus tract that commonly contains hairs. It occurs under the skin between the buttocks (the natal cleft). |
| **Abscess**                                                                  | Collection of pus formed just under the skin. Symptoms include swelling, redness, pain, and warmth over the affected area. |
| **Venous leg ulcer**                                                         | A localized chronic wound occurring when the veins are not functioning properly. May be due to venous disease or arterial disease alone, or a combination of both. |
| **Arterial leg ulcer**                                                        | A localized chronic wound occurring when the blood supply to an area of skin is compromised. May be due to venous disease or arterial disease alone, or a combination of both. |
| **Nondiabetic foot ulcer**                                                    | Any open wound present on the foot below the level of the ankle, in a person **without** diabetes. |
| **Burn**                                                                     | Burns are damage to the skin, and sometimes to underlying tissues, caused by contact of the skin with a hot substance. |
| **Other**                                                                    | A complex wound that does not fit into any of the above categories. |
patient during the survey period and if care was shared between services, then one care provider was nominated to complete the form. The survey was designed to collect anonymized patient and health professional data, and individual patient consent was not required. While one form was completed per patient, data on up to four wounds could be collected when patients had multiple complex wounds. If a patient had more than four wounds, care providers reported the four most serious wounds (based on their clinical judgment).

**Statistical analysis**

Descriptive statistics were produced using appropriate measures such as proportions or means alongside standard deviations (SDs). The point prevalence for all complex wounds (both overall and by gender) as well as for individual wound types was estimated using 2011 Census estimates of the population of Leeds as the denominator. The 95% confidence intervals (CIs) around estimates were constructed using the non-continuity corrected Wilson score method. Analyses were conducted in Stata v12.1 (StataCorp LP, College Station, TX).

**RESULTS**

**Survey population**

In total, data were received for 1,103 people with information provided for 1,416 complex wounds. The majority of people (75.1%) had one complex wound; the average number of

| Table 2. Wound categorization definitions |
|------------------------------------------|
| Category 1: Nonblanching erythema (intact skin with nonblanchable redness of a localized area usually over a bony prominence) |
| Category 2: Partial thickness (partial-thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or serosanguineous blister. Presents as a shiny or dry shallow ulcer without slough or bruising) |
| Category 3: Full-thickness skin loss (full-thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling) |
| Category 4: Full-thickness tissue loss (full-thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present. Often includes undermining and tunneling) |
| Unstageable/unclassified: Full-thickness skin or tissue loss—depth unknown. Full-thickness tissue loss in which actual depth of the ulcer is completely obscured by slough (yellow, tan, grey, green, or brown) and/or eschar (tan, brown, or black) in the wound bed |

| Table 3. Wound assessment form |
|--------------------------------|
| Healthcare worker completing the form |
| Job title, band (grade), service |
| Patient demographics |
| Patient’s age, gender, ethnicity, type of accommodation |
| Comorbidities |
| Cardiovascular disease, peripheral vascular disease, diabetes, arthritis, orthopedic surgery and conditions, conditions affecting airways, neurological conditions, stroke, cancer |
| Other patient details |
| Continence, intravenous drug use, nutritional status, mobility, Braden risk score, antibiotic use, ankle mobility |
| Current complex wound care |
| Frequency of wound-related consultations per week, duration of most recent consultation, location of wound treatment, total number of current complex wounds |
| Details of up to four complex wounds |
| Duration of wound, type of wound, underlying cause, Doppler ABPI, location of wound, category of wound, exudate, condition of wound margin/surrounding skin, malodor, treatment objectives, wound dressing (primary and secondary), drugs/medicines, bandaging, hosiery, equipment (such as pressure relieving mattresses), footwear/orthotics/foot pressure relieving equipment, other treatments (hyperbaric oxygen therapy, physiotherapy, occupational therapy) |

ABPI, ankle brachial pressure index.
complex wounds per person was 1.36 (SD 0.99). Most of the wounds captured (44.9%) were Category 2 wounds followed by Category 3 (28.7%).

Most people with complex wounds (91.8%) were of white British ethnic origin and there were slightly more females than males (56.8% compared with 42.7%). Over 60% of people with a complex wound were aged between 60 and 89 years. Ages ranged from less than 1 year to 108 years with a mean of approximately 70 years (SD 19.41). Mean age varied by wound type from approximately 80 years for people with an arterial/venous leg ulcer (SD 11.32) to just over 37 years for people with pilonidal sinuses (SD 20.33) (Table 4).

Approximately 81% (n = 889) of people had at least one comorbidity and these people had an average of 2.01 comorbidities (SD 1.00) with cardiovascular disease being the most common (44.8%). Arthritis, diabetes, and peripheral vascular disease were also common (27.0, 20.9 and 19.6%, respectively). Forty-one percent of people with complex wounds walked with difficulty while 39.4% walked freely. Approximately one quarter of the survey population had impaired continence with urinary incontinence being nearly twice as common as fecal incontinence (23.0 and 12.1%, respectively) and 9.3% having both.

### Point prevalence estimates

Table 5 shows point prevalence estimates for all complex wounds. The overall point prevalence of people with complex wounds in Leeds was estimated as 1.47 per 1,000 of the population (95% CI: 1.38 to 1.56). Point prevalence was higher for females than males at 1.63 per 1,000 (95% CI: 1.51 to 1.77) compared with 1.28 per 1,000 (95% CI: 1.17 to 1.40). Prevalence of complex wounds increased with age (Table 6) and was highest in people aged 90 years and over (22.88 per 1,000, 95% CI: 19.08 to 27.42). Complex wounds were least common in children below 10 years of age.

### DISCUSSION

This study estimates the point prevalence of people with complex wounds in a UK city at 1.47 per 1,000 of the population. This prevalence is lower than estimates reported in recent studies in other geographical locations (range 2 to 3.55 per 1,000 of the population), probably reflecting differing methodology (previous studies have included noncomplex wounds).
Point prevalence of complex wounds

Table 7. Point prevalence estimates per 1,000 by wound type

| Wound type                  | Frequency | Point prevalence | 95% confidence interval |
|-----------------------------|-----------|------------------|-------------------------|
| Abscess                     | 33        | 0.04             | (0.03, 0.06)            |
| Burn                        | 15        | 0.02             | (0.01, 0.03)            |
| Fungating carcinoma         | 14        | 0.02             | (0.01, 0.03)            |
| “Other”                     | 82        | 0.11             | (0.09, 0.14)            |
| Pilonidal sinus             | 25        | 0.03             | (0.02, 0.05)            |
| Pressure ulcer              | 236       | 0.31             | (0.28, 0.36)            |
| Traumatic wound             | 81        | 0.11             | (0.09, 0.13)            |
| Foot ulcers                 | 166       | 0.22             | (0.19, 0.26)            |
| Diabetic foot ulcer         | 95        | 0.13             | (0.10, 0.15)            |
| Nondiabetic foot ulcer      | 71        | 0.09             | (0.07, 0.12)            |
| Leg ulcers*                 | 331       | 0.44             | (0.40, 0.49)            |
| Arterial/venous leg ulcer   | 79        | 0.11             | (0.08, 0.13)            |
| Arterial leg ulcer          | 38        | 0.05             | (0.04, 0.07)            |
| Venous leg ulcer            | 218       | 0.29             | (0.25, 0.33)            |
| Surgical wounds             | 156       | 0.21             | (0.18, 0.24)            |
| Dehisced surgical wound     | 51        | 0.07             | (0.05, 0.09)            |
| Other surgical wound        | 105       | 0.14             | (0.12, 0.17)            |

*For individuals with at least one leg ulcer of any type.

were more common, approximately one in five people of the sample population had a less common type of complex wound (e.g., traumatic wound, abscess, pilonidal sinus, burn, and fungating carcinoma). This finding suggests that a more comprehensive understanding of the extent and impact of complex wounds on society is best achieved by approaching complex wound care as a whole rather than particular wound types. Failure to account for people with less prevalent wounds will underestimate the real impact of complex wounds on the population and the resources used in providing health care.

Complex wounds are often considered to be a condition associated with older age and while the findings of this study (and other previous studies) support the view that prevalence increases with age, it is not a condition exclusive to older age. People affected by pilonidal sinuses, surgical wounds, burns, and abscesses were younger than those with other types of complex wounds. This finding may be explained, at least in part, by these wounds not being closely associated with underlying conditions and comorbidities that become more common place in older age and predispose the development of certain complex wounds. Health care service planners need to consider how best to accommodate the needs of all service users, taking into account factors such as the age of people with complex wounds. Wound care services may need to be adapted to a primarily elderly population but with flexibility to deal effectively with the potentially differing needs of a smaller but younger population.

Future research in this area would benefit from enhanced collaboration between interested researchers and clinicians. To date, differences in the design, methods, and reporting of point prevalence studies of complex wounds mean that comparison of study findings is problematic. For example, while developing our study, we were unable to identify an internationally agreed definition of what constitutes a leg ulcer, despite leg ulcers being one of the most prevalent types of complex wound. Definitions of leg ulcer in the leg ulcer prevalence literature differ to the extent that pooling of data from these studies is not currently sensible. Comparison between studies could also be enhanced if future studies adopted a similar design including surveying total (geographical) populations rather than subpopulations (e.g., selective care settings) and using official, contemporaneous population data to calculate prevalence estimates. Collaboration between clinicians and researchers in the field of wound care could potentially increase harmonization of the design and methods, which could be applied to future prevalence studies of people with complex wounds.

Strengths and limitations

The study has a number of strengths. This geographically defined study is one of the first to report all complex wounds in a UK population and also first to report the prevalence of a number of under-researched wound types. Both public and private health care providers were included in the survey (including hospices and prisons) and participation was extremely high (only one general practice refused to take part). Data quality was excellent with limited missing data for all variables and, because consent was not required, our estimates are unaffected by consent rates. Definitions were reported for all wound types and the estimated population of Leeds was taken from national census data, which were contemporaneous with the survey.
Nonetheless, the survey also has some limitations. Despite measures implemented to avoid duplicates, it is still possible that some were included (because of the anonymous nature of the data). However, estimates of the prevalence of wound types are within the range reported by previous studies (except for people with pressure ulcers where the estimate was lower), indicating that duplication was probably not a major issue. A further consequence of using anonymous data meant it was not possible to verify any data queries. Our survey does not capture information about people who may have a complex wound but are not currently receiving care from any of the providers included in this survey and are “self-treating,” an issue inherent to care provider surveys (case ascertainment). Therefore, studies of this kind are likely to underestimate the “real” prevalence of complex wounds.

Finally, cross-sectional surveys provide essential basic data about the extent and nature of complex wounds within a population. Further information from this survey will be reported separately, for example, care provision for people with a complex wound and prevalence of complex wounds in people who are injecting drug users. However, cross-sectional surveys are limited in their capacity to inform clinicians and care providers about data related to patient outcomes such as wound healing and time to healing. Further research could usefully focus on observational, prospective datasets that would facilitate deeper insights into complex wounds to inform clinical practice, improve quality of care, and optimize patient outcomes.

Approximately 1.47 individuals per 1,000 in a UK city are affected by at least one complex wound. The most prevalent types of complex wounds are pressure ulcers and leg ulcers. Collectively, less prevalent wound types account for around one in five people who have a complex wound. Failure to capture information on these less prevalent wounds will underestimate the total impact of complex wounds on the population and health care resources.

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