

INTRODUCING LEG ULCER TELEMEDICINE INTO RURAL GENERAL PRACTICE

Abstract

Background: Leg ulcers are a common problem and the cause of significant morbidity. Their treatment is estimated to cost £600m per year, placing an enormous burden on NHS resources. The introduction of a telemedicine system for the care of leg ulcers has the potential to reduce ulcer duration, total care episode cost and patient cost. **Aims:** To look at the impact of introducing a leg ulcer telemedicine (LUTM, SAASoft Ltd) system on conventional leg ulcer care in a rural general practice. **Methods:** A retrospective analysis was undertaken of all patients presenting with a non-healing wound on their lower leg (knee to malleolus) of at least one month's duration in one rural general practice between December 2006 and December 2007. Patient, primary care and secondary care costs were compiled. Following this baseline audit, a telemedicine system was introduced and the same data was collected prospectively for a further year. **Results:** After the introduction of LUTM, patient travel cost fell (from £68 to £49 per patient), primary care cost remained unchanged (from £357 to £353 per patient), secondary care cost increased (from £226 to £263 per patient) and procedure cost remained the same. GP input fell from 83% to 24% of patients and secondary care involvement rose from 45% to 60% of patients. The median time for the healing for leg ulcers was reduced from 105 to 70 days. **Conclusion:** The introduction of LUTM to this rural general practice improved leg ulcer care through improved communication, assessment and treatment, objective evidence of response to treatment and increased secondary care involvement. This has resulted in faster healing rates and is cost-effective. As a result of these findings, the authors intend to introduce LUTM to local general practices across the region.

KEY WORDS

Telemedicine
Leg ulcer
General practice

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Leg ulcers are common. It is estimated that 1.2–3.2 per 1,000 individuals in the UK have an active leg ulcer that requires treatment (Nelzén et al, 1994; Angle and Bergman, 1997; Posnett and Franks, 2007). The total cost of leg ulcer management remains unclear but is estimated to be £600m per year (Logan, 1997). However, this figure does not include the personal cost to patients (financial, time and travel) or take into account the impact on their quality of life (Moffatt et al, 1992).

LEG ULCER TELEMEDICINE

The leg ulcer telemedicine (LUTM;

SAASoft Ltd) system is a dedicated patient record system, which can be used to monitor the progress of skin conditions or wounds such as leg ulcers. The images and care records stored on the system are sent securely via NHSnet between primary and secondary care (Wild, 2005; NHS Connecting for Health: Integrated Service Improvement Programme, 2006). LUTM allows communication between primary and secondary care professionals through the use of e-referrals, treatment plans, digital photographs (Figures 1 and 2) and graphs of healing rates, which predict the healing point.

‘The area of the ulcer is calculated using the LUTM software. This allows for an objective measurement of the ulcer and acts as an early indicator if treatment is not working’

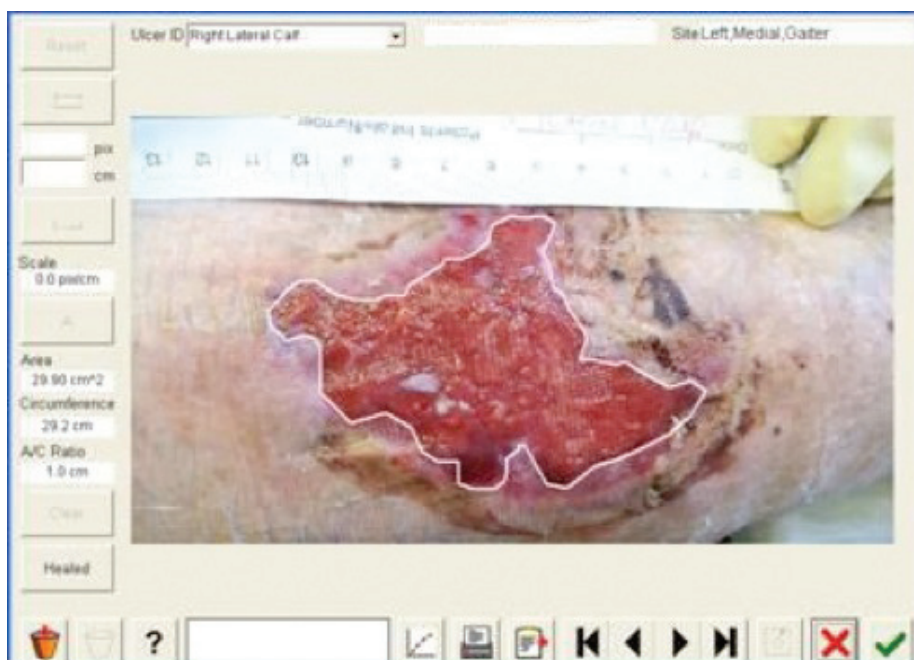


Figure 1: Treatment plan as documented on the leg ulcer telemedicine system.

Figure 2: Digital photo imported into the leg ulcer telemedicine system, showing appearance and measurement of the ulcer.

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With the LUTM system, each patient has a treatment plan. This documents the appearance of the ulcer, the treatment given, the dressings that have been applied at each visit, appointment times and duration, the system user and when the patient will next be seen.

A digital photo of the ulcer is taken and imported into the LUTM system. The area of the ulcer is calculated using the LUTM

software (Samad et al, 2002). This allows for an objective measurement of the ulcer and acts as an early indicator if treatment is not working. It also creates a record of what the ulcer looks like, which can be used for comparison by staff members.

The graph of healing rate charts the area of ulceration over time in weeks. The software can be used to estimate the leg ulcer healing date (Prince and Dodds,

Table 1

Patient travel costs before and after introduction of leg ulcer telemedicine system (LUTM)

	<i>Conventional care (29 patients, one year)</i>	<i>After introduction of LUTM (25 patients, one year)</i>
<i>Miles travelled (cost at 53p/mile)</i>	3,634 (£1,926.02)	2,214 (£1,173.20)
<i>Parking fees</i>	£40.50	£46.50
<i>Total patient travel cost</i>	£1,966.52 (£68 per patient)	£1,219.70 (£49 per patient)

2006). This information can be used both to optimise care and to encourage and empower the patient (Cooper, 2007). The patients can view the graph/photos on the computer or have a print out, so they can see their progress, which motivates them.

HYPOTHESIS

It is proposed or anticipated that the introduction of LUTM will:

- ▶▶ Reduce ulcer duration
- ▶▶ Reduce total care episode cost
- ▶▶ Reduce patient personal cost.

AIMS

The aim of this study was to look at the impact that introducing a LUTM system had on conventional leg ulcer care in one rural general practice.

METHODS

The study was undertaken in a semi-rural general practice in the UK, which had a population of 12,687.

Retrospective analysis of patients with a non-healing wound on their lower leg (knee to malleolus) of at least one month's duration was undertaken for a one-year period (12 December, 2006 to 11 December, 2006). Patient, primary and secondary care costs were collected.

The total healthcare cost was calculated from patient, primary and secondary care costs. For primary care cost, the practice manager calculated the cost of the leg ulcer clinic room, salaries of the leg ulcer nursing team and clinic room cleaning costs retrospectively for the study year. Details of all dressings applied and medications prescribed were obtained from the patient and prescription records, and the total cost

was calculated using the general practice pharmacy price list.

Secondary care costs were calculated using the charge to the primary care trust (PCT) for secondary care outpatient appointments and the cost of any procedures performed. The outpatient fee included the cost of consultant appointments and any investigations, such as duplex scans, performed as a result of that appointment. Procedures performed included angiography and varicose vein surgery.

Patient costs were calculated using their mileage to and from their leg ulcer appointments and their parking charges.

Following this baseline audit, LUTM was set up in the practice. Staff involved in the general practice leg ulcer clinic were trained by a specialist nurse familiar with the system. This education continued until the nursing staff were confident using the system and could independently use the camera, software and communication link.

The same data (patient, primary and secondary care costs) were collected prospectively for a year (1 January 2008 to 31 December, 2008). The only additional information collected was the quantity of LUTM communication, which logs all emails, between primary and secondary care without attendance of the patient at secondary care.

RESULTS

In the year before the introduction of LUTM, 29 patients attended the general practice with lower limb ulceration. In

'It is anticipated that the introduction of LUTM will reduce ulcer duration, reduce total care episode cost and reduce patient personal cost'

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‘There is now less variation in the types of antibiotic prescribed, with only five types prescribed after LUTM compared with 10 types before LUTM’

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Table 2

Primary care costs before and after introduction of leg ulcer telemedicine system (LUTM)

	Conventional care (29 patients, one year)	After introduction of LUTM (25 patients, one year)
General practise surgery cost	£5,974.00	£3,757.23
Dressings cost	£4,006.59	£3,752.26
Medication cost	£385.84	£326.46
LUTM cost	£0	£1,002
Total primary care cost	£10,366.43 (£357.46 per patient)	£8,837.95 (£353.52 per patient)

the year following its introduction, 25 patients met the inclusion criteria.

The total cost of the treatment received before and after implementation of LUTM was calculated by breaking down the cost into patient cost (Table 1), primary care cost (Table 2) and secondary care cost (Table 3). Travel cost was calculated using the total distance travelled to and from leg ulcer appointments. This mileage was then used to calculate travel cost using the Royal Automobile Club (RAC) (2006/7) estimate of running costs at 53p per mile.

Primary care cost represents the cost of running the leg ulcer clinic for the total time of the trial. Dressing, wound cleaning solution and medication (ulcer-related antibiotics and analgesia) costs are given as a total for all patients over the trial period (Table 2). The cost incurred by the telemedicine system itself over the study period was £1,002 (£2 every time the LUTM system was used). The primary care cost for all patients during the year before the introduction of LUTM was £10,366.43 (n = 29) and during the year after its introduction was £8841.95 (n = 25). Secondary care cost is the total cost charged to the primary care trust (PCT) for new referral or follow-up consultant

clinic appointments. The appointment fee includes the cost of dressings, any duplex scans performed and wound cleaning solutions used at that appointment.

The procedure cost was the total amount charged to the PCT for procedures such as varicose vein surgery (Table 4). The secondary care cost for all patients over the year before the introduction of LUTM was £6558 (n=29) (Table 3) and after its introduction was £6570 (n=25).

Figure 4 shows the number of courses of antibiotics prescribed. It can be seen that there was an overall decrease in antibiotic use after the introduction of LUTM and a decrease in the total number of courses of antibiotics prescribed, e.g. 25 courses of flucloxacillin were prescribed before LUTM, compared with only 12 courses after LUTM. Furthermore, there is now less variation in the types of antibiotic prescribed, with only five types prescribed after LUTM compared with 10 types before LUTM. This may be due to increased secondary care input and more appropriate use of antibiotics.

Table 5 shows the number of primary and secondary care appointments attended by the patients in the study, the median

Table 3

Secondary care costs before and after introduction of the leg ulcer telemedicine system (LUTM)

	Conventional care (29 patients, one year)	After introduction of LUTM (25 patients, one year)
Appointment cost	£3,396	£3,408
Procedure cost	£3,162	£3,162
Total secondary care cost	£6,558	£6,570

KEY POINTS

- ▶▶ Early assessment and appropriate treatment are known to improve healing rate and reduce recurrence, thereby benefiting patients as well as reducing costs
- ▶▶ Leg ulcer telemedicine (LUTM, SAASoft Ltd) is a dedicated patient record system, which can be used to monitor the progress of wounds such as leg ulcers and has the potential to reduce ulcer duration, total care episode cost and patient cost
- ▶▶ Implementation of LUTM in one rural general practice improved leg ulcer care through improved communication, assessment and treatment, objective evidence of response to treatment and increased secondary care involvement

Table 4

Number of procedures performed before and after introduction of the leg ulcer telemedicine system (LUTM)

	<i>Conventional care (29 patients, one year)</i>	<i>After introduction of LUTM (25 patients, one year)</i>
<i>Varicose vein surgery</i>	2	2
<i>Angioplasty</i>	1	1

time from referral to secondary care appointment, the percentage of patients for whom email advice was sought, the percentage of patients receiving GP advice, and finally the percentage of patients who had secondary care input. Secondary care involvement increased after the introduction of LUTM as a result of improved communication and access to secondary care, reduced waiting times for secondary care appointments and prompt referral.

With increased secondary care input there has been a small increase in secondary care interventions to improve healing (*Table 4*). Even though the same number of procedures were performed, there are slightly fewer patients after LUTM. Thus, there is a relative increase in procedures per patient.

Table 6 shows the average (median) time taken for an ulcer to heal. Patients whose treatment straddled the two trial periods were excluded from the study in order to remove bias. The median time taken for a leg ulcer to heal fell from 105 days to 70 days. *Table 7* compares the total cost of leg ulcer care with the cost per patient, before and

after the introduction of LUTM. The total cost is obtained from the sum of patient, primary and secondary care costs. In contrast to total cost, after implementation of LUTM the cost of leg ulcer care per patient increased slightly from £651 to £665.

DISCUSSION

Leg ulcers are a common problem and the cause of significant morbidity. The majority of those affected are elderly and have significant co-morbidity and poor mobility (Thomason, 1999). It is known that early assessment and appropriate treatment of underlying vascular disease can improve healing rate and reduce recurrence (Ghuri et al, 1998). Rapid assessment of these patients, therefore, together with appropriate treatment and reduced travel time, will benefit them greatly.

It is also known that the motivation of patients with leg ulcers is important. It involves them in the care of their ulcers and provides them with evidence (pictures and graphs) that the treatment is working, further improving the outcome (Bawden and Lindsay, 2007).

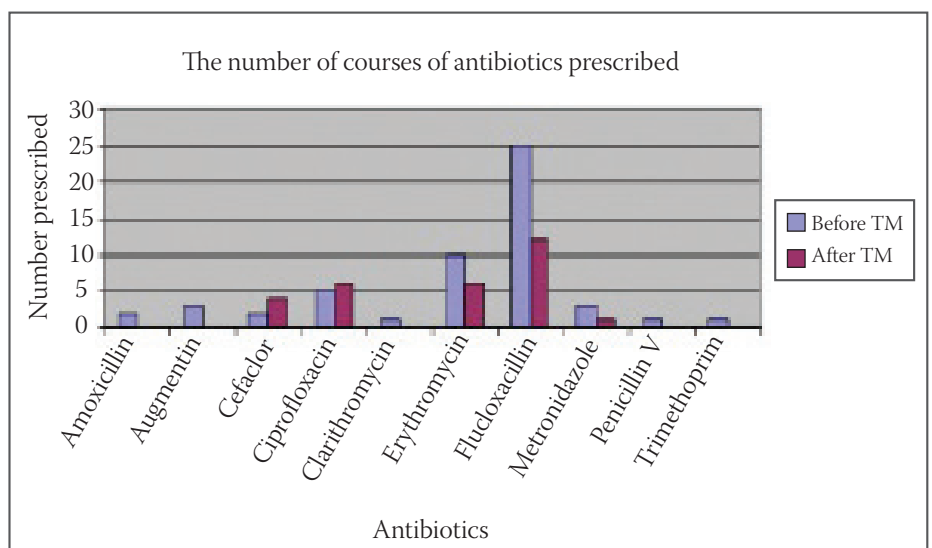


Figure 4: Number of courses of antibiotics prescribed before and after introduction of the leg ulcer telemedicine system (LUTM).

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The majority of leg ulcer care is undertaken in general practice, specialist clinics and secondary care. The findings of this study demonstrate that implementation of LUTM in one general practice improved leg ulcer healing and was cost-effective. Although there has been an increase in secondary care involvement and, thus, an increase in secondary care cost, this is more than outweighed by the reduced GP input, reduced treatment duration with improved healing, reduced travel for patients and more appropriate medication/dressing usage.

The increase in the number of patients receiving secondary care input resulted from improved communication and team work between primary and secondary care providers, prompt, appropriate referral to secondary care and reduced waiting time from referral to secondary care appointment.

There were some notable changes in dressing usage following the introduction of LUTM. Practitioners were, for the first time, able to evaluate the effectiveness of the different dressings they used and compare their efficacies. One key change in dressing usage following implementation of LUTM was the switch to Atrauman® (Hartmann), which is cheaper than Urgotul® (Urgo) and Tricotex® (Smith & Nephew Healthcare) but just as effective. Another was the use of Urgotul® SSD (Urgo) instead of Actisorb® Silver (Systagenix) on the advice of secondary care professionals.

It should also be noted that Actico® bandage (Activa™ Healthcare) had not been used by primary care professionals in the practice before the introduction of LUTM, but was used subsequently after secondary care practitioners highlighted that this was an alternative method of compression.

The improvement in ulcer healing was achieved through a combination of:

- ▶▶ Objective monitoring of healing, facilitating early detection of deterioration and appropriate change in treatment
- ▶▶ Swifter primary care referral to secondary care appointment
- ▶▶ Improved communication between



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‘The findings of this study demonstrate that implementation of LUTM in one general practice improved leg ulcer healing and was cost-effective’

Table 5

Primary and secondary care received before and after introduction of the leg ulcer telemedicine system (LUTM)

	<i>Conventional care (29 patients, one year)</i>	<i>After introduction of LUTM (25 patients, one year)</i>
<i>Primary care appointments</i>	751	472
<i>Secondary care appointments</i>	27	31
<i>Median time from referral to secondary care appointment</i>	47 days	18 days
<i>% of patients for whom email was sought</i>	0%	56%
<i>% of patients having GP input</i>	83%	24%
<i>% of patients having secondary care input</i>	45%	60%

Table 6

Leg ulcer healing time before and after introduction of the leg ulcer telemedicine system (LUTM)

	<i>Conventional care (29 patients, one year)</i>	<i>After introduction of LUTM (25 patients, one year)</i>
<i>Median</i>	105 days	70 days

Table 7

Total cost of leg ulcer care before and after introduction of the leg ulcer telemedicine system (LUTM)

	<i>Conventional care (29 patients, one year)</i>	<i>After introduction of LUTM (25 patients, one year)</i>
<i>Total cost of leg ulcer care</i>	£18,890.95	£16,631.64
<i>Cost per patient</i>	£651.41	£665.27

- primary and secondary care
- ▶ Increased secondary care input in a timely and targeted manner.

CONCLUSION

The introduction of LUTM to a rural general practice improved leg ulcer care in the practice. Multiple factors contributed to this outcome; these can be summarised as follows:

- ▶ Faster healing rates
- ▶ Increased secondary care involvement
- ▶ Reduced GP involvement
- ▶ Improved assessment and treatment

- ▶ Objective evidence of response to treatment
- ▶ Improved communication between primary and secondary care
- ▶ Reduced waiting time from referral to secondary care assessment
- ▶ Cost-effective.

As a result of these findings, the authors intend to introduce the LUTM system to local general practices across the region.

ACKNOWLEDGEMENTS

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