

# SeeWound: Introducing Precision Medicine to Wound Care

## Automatic AI Based Assessment of Wound Size Progression

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### Abstract

SeeWound is the next generation clinically proven precision solution for AI-based wound assessments. Through expert precision and reproducibility, the application enables wound care professionals and organizations treating wounds to substantially improve care outcomes. The fully automated solution has shown to lower the time-to-identification of non-functional treatments by more than 4 weeks, compared to conventional methods. Nurses have reported higher control of the wound treatment progression and concomitantly improved levels of wound healing competence in their day-to-day work. Patients can now, for the first time, be fully included in the care planning process, and thus aware of the impact of the specific home care practices, such as the value of proper compression treatment, diet, exercise, and footwear. Scientifically documented, SeeWound is praised by specialized Swedish wound care providers at major university hospitals and wound centers in Sweden, and the application is currently the broadest implemented AI-solution within Swedish healthcare.

**Keywords:** Precision Medicine, Hard-to-heal wounds, Wound healing, Artificial Intelligence

### 1. SeeWound's Performance and Reliability

SeeWound's artificial intelligence and advanced measuring technique for hard-to-heal wounds achieve a relative error of less than 2% and an outstanding precision of 99%. The reproducibility rate is 94% and a maximum deviation between two consecutive measurements is 6%, SeeWound's AI predictive performance has a mean accuracy of 99%, a mean sensitivity of 93%, and a mean specificity of 99% when compared to the ground truth (1). The application demonstrates high inter and intra operability and is almost completely unbiased towards user experience or wound size. To acquire reliable data on wound progression, SeeWound users simply capture a single image per patient and visit without the need for any additional hardware or system integration.

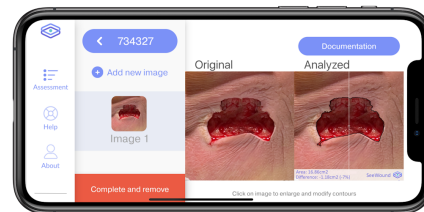


Figure 1: SeeWound Application

## 2. Clinical Benefits: Real-life examples

Traditional wound measurement methods using rulers have well-documented inaccuracy and true-error rates ranging from 12% to 87% (2-4). Instruments for objective and precise measurements have been requested for a long period of time, especially at specialized clinics that have already applied precision medicine in other verticals of care in the organization. The 2022-2023 Swedish national guidelines of hard-to-heal wounds, demands that these wound’s progressions are identified within 2 weeks (5-8), which is nearly impossible with documented precision in wound measurements using conventional methods. Precision medicine through fully objective and automatic tracking of wound size progression allows health care professionals to evaluate treatment outcomes more efficient and reliable. Health care professionals at Linköping University Hospital used SeeWound to monitor 30 patients over three months to track healing rates and compared the innovative solution to traditional ruler measurements.

Among the 30 patients monitored, one of the patient cases is for illustrative purposes displayed hereafter. The patient case is explained through a comparative analysis of an observed wound. The data was acquired by SeeWound, can be found in figure 2 & 3, and through the traditional disposable paper ruler method. SeeWound data concluded that the treatment during the first 11 days was successful. However, the positive trajectory was subsequently followed by a gradual wound size increase persisting for 18 days before the successful healing progression was resumed. Meanwhile, the health care professionals using more traditional methods to monitor the wound could not with certainty identify an actual wound size development

until day 31, where an intervention on treatment plan then took place.

If the successful healing intervention initiated on day 31 instead would be initiated on day 13 based on SeeWound data, it would have spared the patient 15 days of open wound and 5 dressing changes. For all 30 patients, the corresponding cost-saving attained per patient was on average 12% or 4.000 SEK (400€) with an average of >4 weeks shorter time-to-identification of non-healing treatment as compared to when manual rulers were used for wound size assessments.

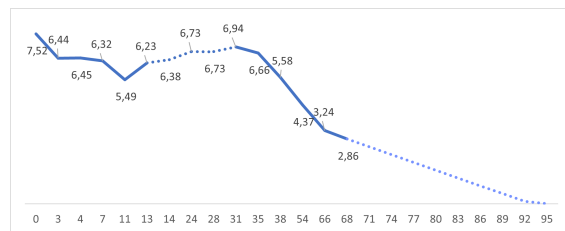


Figure 2: Wound tracking with ruler, identified non-successful treatment at day 31

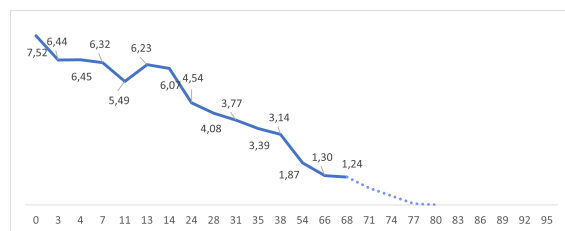


Figure 3: Adjusted healing trajectory from figure 2 when SeeWound data identifies non-successful treatment at day 13 instead of day 31

The following, figure 4, is a patient case where SeeWound data was used from day

one. This patient case explains how objective and precise data can be used in daily wound practice to improve effectiveness of treatment evaluation, and how quick trajectories can be identified with the usage of precision tools.

The patient and treating staff were able to follow the wound healing trajectory with ease at each wound dressing change (seen in the x-axis). The points marked in red are when a decision was been made on the treatment plan or a new recommendation to the patient was provided. What permeates this patient journey is that positive developments of the wound surface area are identified quickly despite the small variations in wound size, e.g., from dressing change 5 to 8 the wound increased by 22 mm<sup>2</sup>. This may be considered a very small change, but with the SeeWound methodology, an almost 13% increase in size is considered large and calls for a change in wound treatment or a new recommendation to the patient. The example exemplifies the importance of continuous monitoring for successful healing.

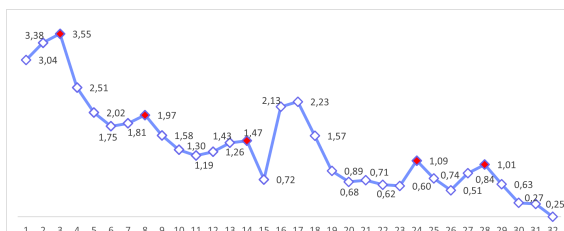


Figure 4: Early trend spotting with SeeWound data: positive patient journey and healing trends

### 3. SeeWound - The Nurse and Organization Experience

Designed by and for nurses, SeeWound is developed to be the perfect tool for daily use in wound care and is currently widely used across the Nordics. For wound care

professionals, precise monitoring is necessary to assess the continuous performance of the wound care organization - “If you claim to be a professional wound care organization, you have to be able to consistently and objectively evaluate your results” (9).

After introducing SeeWound, nurses and organizations have been seen to take a higher responsibility of the outcome of the wound treatment when offered an objective tool that support their day-to-day work. This has also led to higher levels of wound healing competence across the organizations.

The following patient case depicts how both nurses and an organization uses SeeWound data to evaluate both patient treatment and organizational wound competence. Figure 5 below describes the patient journey through healing and wound progression of two wounds, from a home care facility in Stockholm municipality, showcasing the competence building effect from SeeWound on the wound care organisation. Upon examining the healing rates on day 31 and day 56, it was observed that the healing rate had decelerated for both wounds. In this instance, the treating organization used SeeWound data to identify the stagnation, evaluate and interview the responsible nurse to identify the root cause of the deterioration. It was found that two nurses on the staff-rotation scheme for the particular patient did not have knowledge of how to properly debride wounds (an insight that would not have been identified without SeeWound). At day 56, the responsible nurse was back in rotation to treat the wounds and patient, after both wounds had undergone proper debridement at day 59, the two wounds returned to a positive healing trajectory until completely healed. The first wound, wound 1 in figure, continued to heal another 28.9% in only 3 days. The second wound, wound 2 in figure, required a more rigorous debridement, leading to a larger increase of wound surface area before also re-

turning to the same positive healing trajectory.

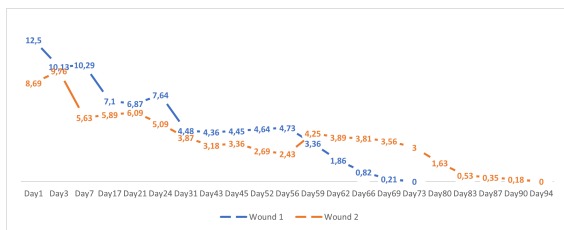


Figure 5: Identified lack of debridement expertise within the organization

#### 4. SeeWound - The Research Experience

In the Nordics, SeeWound is widely used in research settings, taking part in cutting-edge research projects such as PhD projects and international projects aimed to improve treatments of hard-to-heal wounds as well as improve quality of life for this heavily burdened patient group. The application is praised across Sweden’s University Hospitals; “With unparalleled usability and precision this instrument provides us researchers with invaluable insights that are essential for advancing and improving treatments of hard-to-heal wounds” (Linköping University Hospital Lund University Hospital). Several researchers have used the device to follow drug or dressing related effects in clinical trials and claim: "This is the tool researchers have been longing for".

#### 5. SeeWound - Patient Perspective

Patients have all heard "it looks good" or "we have to be patient and see the effects over the next couple of weeks". With SeeWound data the patient can for the first time be involved in their own treatment and gain insights on a weekly basis. Instead of hearing the te-

dious subjective thoughts, patients can now be included in the treatment and understand the exact progression, by having data-based discussions "The wound has healed 6% since last week" or "The wound size has increased by 6%, lets discuss your treatment, nutrition and physical activities".

By allowing healthcare providers to quickly react to changes or stagnation in wound healing, and thereby improve healing and at the same time convey this process to the patients, an enhanced patient engagement is reached. Clinics, primary care, as well as home healthcare providers have all reported increased patient involvement when they obtain real time results of their healing progress. Improved communication between nursing staff and patients has resulted from sharing wound images and healing trajectories, facilitating more productive dialogues about the current treatments. Patients also become more aware of the impact of different interventions in home care practices, such as diet, movement, and footwear, as they witness the consequences in the wound progression. A recurring observation has been that patients reportedly, for the first time during wound treatments, have turned to their caregivers and requested precise follow-ups and agile work of treatment selections.

#### 6. Conclusion

SeeWound is a high-precision AI-based instrument that is making real advancements in the field of hard-to-heal wounds, benefiting medical research, and improving patient care outcomes. Designed to accurately assess wound progression and evaluate treatment effectiveness, SeeWound has gained widespread adoption among wound care professionals in the Nordics. This tool supports healthcare providers in their day-to-day work, enabling enhanced care and valu-

able insights for both the professionals and the organization as a whole.

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