

Negative pressure wound therapy: an evaluation of a new connected device RENASYS™ TOUCH CONNECT

KEY WORDS

- ▶ Efficiency
- ▶ Innovation
- ▶ NPWT
- ▶ Utilisation
- ▶ Value-release

Aim: To understand how a new connected negative pressure wound therapy (NPWT) device (RENASYS TOUCH CONNECT) could impact on minimising the risk of losing pumps, improving fleet management processes and utilisation, and identifying efficiency gains in a large UK NHS Trust. **Method:** The evaluation took place in three phases: the baseline phase-established a clear understanding of how NPWT devices were being used and the difficulties experienced. Second phase: changeover of pumps with training on the new pumps and online portal. Final phase: monitoring the use of the new connected device using both the Trust fleet management system and the new portal. **Results/discussion:** 1) Prior to the evaluation the Trust had lost 18 NPWT pumps over a 2-year period, corresponding to 21% of the total fleet. Following the introduction of the new connected device no further pumps were lost over a 3-month period. 2) The portal enabled the Trust to understand that the pump fleet was under-utilised. 3) The portal gave clinical stakeholders the ability to monitor individual pump's utilization; particularly to identify those treatments characterized by low pump activity (classified as <80% average daily usage). This may help to improve clinical practice. 4) The new connected device may enable better asset management, prevent financial cost related to pump losses, drive efficiency gains and provide detailed usage data. **Conclusion:** This pilot evaluation with the new connected device and online portal has enabled the Trust to better understand how to improve both the NPWT clinical process and the equipment management process. Significant benefits to patients and to the Trust cost base are expected.

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Negative pressure wound therapy (NPWT) is a well-established intervention for the treatment of various wound types, with a number of evidence-based recommendations in place to support its use (Vig et al, 2011; Krug et al, 2011).

There is significant clinical evidence relating to the benefits of NPWT in chronic, hard-to-heal wounds (Dumville and Munson, 2012; Guffanti, 2014; Tovey et al, 2014; Sandoz, 2015; Dumville, 2015a; 2015b) but little, if any, evidence relating to its practical and logistical use from an efficiency and resource use perspective. Anecdotally, it appears that there may be some improvements that could be made to current NPWT devices to optimise the care provision.

Barts Health NHS Trust (Barts Health) is the second largest NHS Trust in the UK, providing

healthcare services to a population of approximately 2.5 million people in East London. Barts Health operates from four major hospital sites (The Royal London, St. Bartholomew's, Whipps Cross and Newham) and a number of community locations including Mile End Hospital. Barts Health's vision is: *"to be a high-performing group of NHS hospitals, renowned for excellence and innovation and providing safe and compassionate care to our patients in east London and beyond"*.

Barts Health is a forward-thinking Trust; innovation is at the centre of its vision, looking to increase efficiency in a very large and complex organisation, through change and by working with new technology providers to achieve future success and sustainability. This is also becoming ever more important when considering the financial pressures



Figure 1. The RENASYS TOUCH CONNECT device

to do “more with less” while still delivering high quality care. Consequently, the potential inefficiencies of NPWT came under review within Barts Health, and in doing so lead to its involvement in an assessment of a new NPWT device from one of its existing commercial partners, Smith & Nephew (S&N).

S&N are a leading global healthcare company, and are already well established in both the disposable, single-use NPWT market (PICO™), and the traditional NPWT market (RENASYS). The new RENASYS TOUCH CONNECT device (Figure 1) is the latest innovation brought by S&N, which represents a significant step forward from the RENASYS devices previously available to Barts Health. The new platform consists of two main elements:

- » An intuitive touchscreen NPWT pump, designed with simplicity of operation in mind
- » An online portal designed to remotely capture the pump’s location and utilisation data.

The portal has the potential to address inefficiency issues, simplify the provision of care and give value release to key stakeholders through improvements in resource utilisation. By making more informed decisions and driving efficiencies, cost savings can potentially be made.

Barts Health’s original objectives for this evaluation were specifically efficiency based:

- » To minimise the risk of losing NPWT devices and the related financial cost
- » To improve pump fleet utilisation and management processes in order to identify potential efficiency gains

- » To increase visibility of therapy provision to reduce non-compliance and potentially improve clinical outcomes.

METHOD

The evaluation was carried out in three distinct phases. The first phase, which was referred to as ‘baseline’ established a clear understanding of how NPWT devices were being used and the difficulties experienced. The second phase was a carefully planned changeover of pumps and consumables with training on the new pumps and portal for all clinicians involved in the application of NPWT. The final phase involved monitoring the use of RENASYS TOUCH CONNECT using both Barts Health’s fleet management system and the new S&N online portal.

During the baseline phase, S&N monitored the movement of pumps in and out of the Equipment Libraries using Barts Health’s Equipment Tracker spreadsheet. The spreadsheet was used to record the time and date when pumps were issued to theatres or wards and when they were collected or returned. These records established a clear picture of pump utilisation and pump losses over a two-year period.

In parallel with establishing the flow of pumps S&N worked with Clinicians and Librarians to understand the decision and application process for NPWT. This enabled Barts Health to explore and understand their difficulties with NPWT (Table 1) and to consider how the features of Connected NPWT might be used to overcome these difficulties (Table 2).

Table 1. Current difficulties with NPWT		
Main challenges	Causes	Impact on Barts Health
Lost and misplaced pumps	Patient transferred to another ward or hospital Patient discharged	Financial cost of lost pumps Growing pressure to meet clinical demand Time wasted searching for pumps across the Trust
Low fleet utilisation	Pumps not promptly returned at the end of the therapy, being idle for long periods of time Pumps stored in inappropriate locations	Inefficient use of medical equipment and related cost impact
Lack of visibility of the therapy provision	Lack of accurate patient monitoring systems	Impossible to identify instances of non-compliance with the therapy and related impact on clinical outcomes

Table 2. Attributes of RENASYS TOUCH CONNECT that help overcome current difficulties

Trust objectives	RENASYS TOUCH CONNECT attributes
To minimise the risk of losing NPWT devices and the related financial cost	Records pump location inside and outside of the hospital, and alerts key stakeholders when a pump exits a defined geographical area Enables easy pump collection, alerts users when therapy ends and provides information on collection address and contact details
To improve fleet management processes in order to meet clinical demand	Remotely monitors pump usage, enabling detailed fleet analysis Enables the identification of inefficiencies in fleet utilisation
To better understand the therapy provision	Records when the pump is not in use, helping clinicians to identify instances of non-compliance with NPWT. Supports clinicians in making informed decisions and gaining more insights over care

During the one month transition period the old pumps were replaced with RENASYS TOUCH CONNECT pumps and consumables, and clinicians were trained by S&N’s local support team. Training comprised both understanding the new pump and its additional features, and learning how to use the online portal.

During this transition, the geofence was set up around each of the four Barts Health sites. The geofence is a virtual geographic boundary, defined by GPS technology that enables software to send an email notification to pre-identified recipients every time a mobile device enters or leaves that defined area (Figure 2).

After the introduction of the RENASYS TOUCH CONNECT pumps in March 2018, Barts Health has

collected two data sets across four hospitals, by using the pre-existing Equipment Tracker and the new S&N online Portal. By jointly analysing the two sets of data, Barts Health was able to track when pumps were issued from and returned to the libraries, whilst the online portal provided visibility of the pumps’ running times and location. The effectiveness of the GPS system and the alerts provided to Clinicians when pumps left their geofence was also tested.

During the three-month evaluation phase Barts Health personnel met regularly with S&N to share the experience of working with the new pumps and using the portal (Figure 3).

Before the evaluation began, suitable privacy and data protection agreements were put in place between S&N and Barts Health, engaging with key stakeholders such as IT, Quality, Compliance and Legal.

This was a non-clinical study and no patient information or information of individual’s health was collected. Ethics approval was not required.

RESULTS

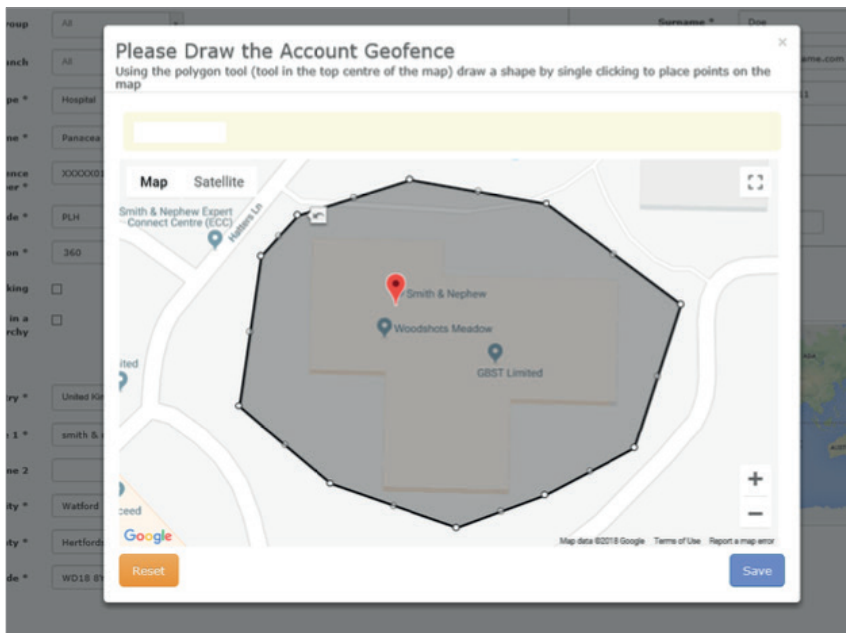
These results compare pump use during this evaluation. Table 3 summarises the time period and the number of previous pumps and subsequently RENASYS TOUCH CONNECT pumps issued.

Remote pump location and losses

Over a 2-year period, 18 pumps from a pump fleet of 84 were lost, averaging slightly less than one per month. This despite the Barts Health policy of not allowing pumps to leave its sites.

During the three months of the evaluation phase no further pumps were lost.

Figure 2. Geofence functionality



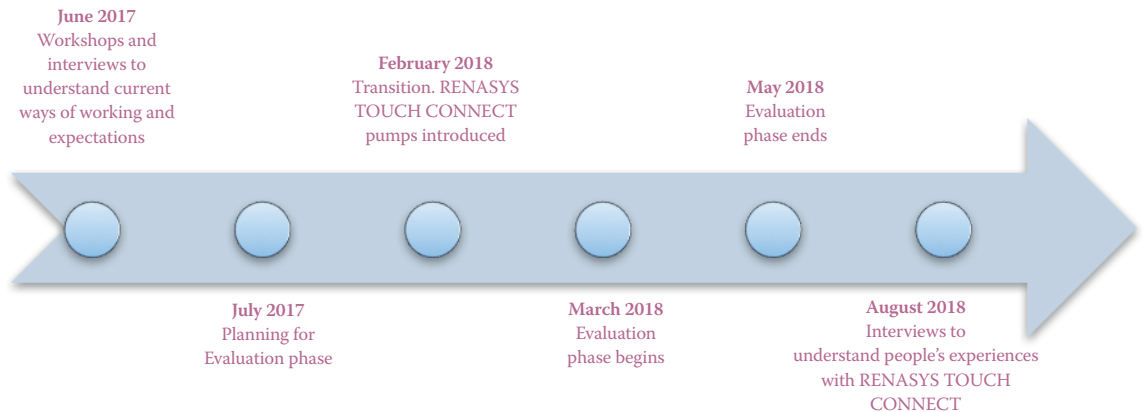


Figure 3. RENASYS TOUCH CONNECT evaluation timeline

Using the RENASYS TOUCH CONNECT pumps and the geofence, 34 individual alerts were recorded, indicating that a pump had crossed the geofence boundary and left the hospital site. This geofence alert system was helpful in alerting Librarians that pumps had left their hospital site and the GPS locating feature informed them where pumps were.

Fleet utilisation

The overall utilisation of the NPWT pump fleet during the baseline period is calculated by comparing the time that pumps were issued out from the libraries, for use on patients, with the overall time that pumps could be available for treatment. During the baseline period, with the previous pumps the average utilisation rate was around 45%.

The RENASYS TOUCH CONNECT pump transmits usage data to the online portal, which provides detailed information on pump and overall

fleet utilisation, whether the pump is in the library or in the wards and theatres.

Table 4 provides an overview of pump utilisation at each location. The combined utilisation of pumps in wards and theatres, whether in use or not is 44% (28% plus 16%). This was consistent with the 45% utilisation figure from the baselining phase.

These data allow discussion about the size of pump fleet required by Barts Health and consideration of the impact of time gaps in moving pumps from treatment to treatment. 13 pumps from the fleet of 84 were not required for therapies during the evaluation phase and pumps were idle, after use, for 28% of total time, prior to being returned to the Libraries.

Therapy insights

The online portal records the time an individual pump is switched on. This provides detailed information on how many days, hours and minutes

Table 3. Number of pumps issued over the 3-month evaluation period

	Baseline (~2 years)	RENASYS TOUCH CONNECT evaluation (3 months)
Length of evaluation	767 days	87 days
Number of pumps issued by the Equipment libraries	559 pumps issued	109 pumps issued

Table 4. Utilisation of the RENASYS TOUCH CONNECT Pump fleet, from the Portal data

RENASYS™ TOUCH CONNECT Pump location and status	Percentage of fleet utilization
Pumps in use on a patient	16%
Pumps issued to ward/theatre but not in use	28%
Pumps available for use, stored in the Library	40%
Pumps not needed during the evaluation period (13 pumps)	16%
Total	100%

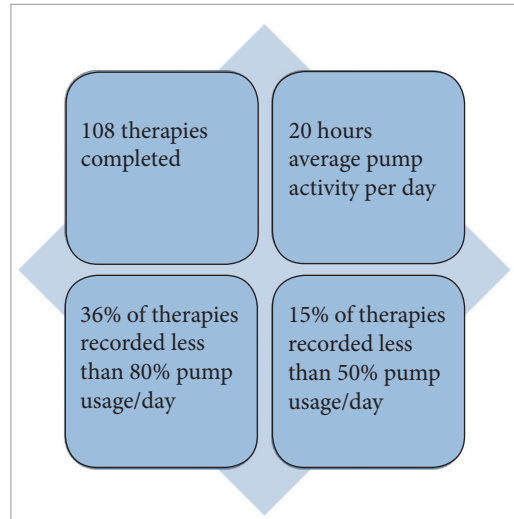


Figure 4. Summary of pump usage

of active NPWT were delivered during each treatment. These data provide useful insights on the care delivery, such as identifying the average pump usage time per treatment and instances of non-concordance with the therapy. A total of 108 therapies were recorded during the evaluation phase and the overall average daily use (i.e. pump running) was 19.9 hours per day (82.9% compliance, assuming full compliance is 24 hours per day).

Further detailed examination of the daily compliance data shows that the overall average can be deceptive. The average number hides the fact that for 36% of the time pumps were running for less than 19 hours of the day and for 15% of the time they were on for less than 12 hours of the day (Figure 4).

Furthermore, it was discovered that one therapy had averaged only 9 hours per day for the 12-day length of therapy. This prompted questions and discussions from clinical staff about how this low level of compliance had occurred.

DISCUSSION

It is widely understood within hospital communities that there are inefficiencies in the current use of NPWT devices. Examples that were highlighted during the baseline phase were:

- » Time wasted in managing pump fleets
- » Clinician’s time lost in searching for pumps (sometimes hidden in store cupboards by colleagues)

- » Patient’s therapy not being optimised between inpatient care and outpatient care
- » Therapy compliance
- » Cost of lost pumps.

These inefficiencies have previously been understated and not understood, due to the lack of information and factual data on fleet utilisation and individual pump use. It has been impossible for budget holders, equipment managers and clinical stakeholders to measure fleet and pump utilisation and adopt effective performance measures and models for improvement.

The RENASYS TOUCH CONNECT evaluation has enabled Barts Health to understand much more clearly how NPWT devices are used across the Trust, providing valuable insights from which areas for improvement can be identified.

Improving fleet management and reducing pump losses

The GPS and the Geofence functionality enabled Barts Health to remotely locate NPWT pumps via the portal and to improve their asset management system, thus minimising the risk of losing NPWT devices and the financial cost related to it.

Prior to the evaluation, Barts Health had lost 18 NPWT pumps over a 2-year period; in contrast, following the introduction of connected NPWT, no further pumps were lost over a 3-month period. In the past, pump losses led to a significant financial cost for Barts Health, as lost medical devices were charged at their market value. Additionally, from a clinical standpoint, there was concern about not having sufficient pumps available to meet clinical demand.

Driving efficiency in equipment management

The portal enabled Barts Health to understand that their pump fleet is under-utilised and to identify the need for an improved fleet management process.

Prior to the evaluation, Barts Health had to assume that pumps were “in use” every time they left the equipment library. During the evaluation, the portal provided full visibility of the fleet utilisation rate, which enabled a more granular understanding of how long pumps are in use every time they are issued out to a patient. These insights on pump activity allowed the medical engineering department to improve Barts Health’s asset management system and reallocate the NPWT fleet

across the different hospital sites, to reflect actual pump need. This improvement has the potential to enable better fleet management across the sites, but also to ensure clinical demand is met, which is crucial for a large multi-site Trust which hosts critical care wards and a major trauma centre.

Supporting clinical outcomes

The portal provided clinical stakeholders with the ability to monitor individual pump's utilisation, and particularly to identify those treatments characterised by low pump activity — classified as less than 80% average daily usage. It is understood that individual pump utilisation data has the potential to improve clinical practice, by ensuring that episodes of non-concordance with the therapy are identified, promptly investigated and corrective measures put in place. The implications from a patient safety standpoint are numerous, as this new approach could potentially shorten therapy times, avoid complications, and enable earlier discharge.

At the time of the evaluation, Barts Health refrained from discharging patients with traditional NPWT pumps, due to the risk of misplacing hospital's assets and the lack of a joined-up system with the community health services. Additional concerns regarding patient concordance with the therapy led to postponing the discharge of patients treated with traditional NPWT, until they were suitable to transition their treatment to PICO, a single-patient-use NPWT device. However, the introduction of the connected pump and the portal offers the opportunity to revisit Barts Health's discharge policy, as NPWT assets can be managed more optimally and instances of non-concordance with the prescribed therapy can be promptly identified. Barts Health believes the insights provided by the new technology will facilitate a conversation with community health services to explore a mutually beneficial operating model.

Potential cost improvements

Barts Health has a 'placed pump' rental contract in place, including the provision of 84 NPWT pumps by S&N, free of charge, with payment for all consumables and lost pumps. In the 2 years prior to the evaluation, the repayment for 18 lost pumps represented a significant financial burden to the Trust as it was an unbudgeted expenditure.

The information now gained and routinely available via RENASYS TOUCH CONNECT will enable better asset management, prevent financial penalties related to pump losses, drive efficiency gains and provide detailed usage data to inform future contract negotiations.

CONCLUSION

This pilot evaluation with the RENASYS TOUCH CONNECT pumps and online portal has enabled Barts Health to better understand the provision of NPWT therapy, and the management of their NPWT pump fleet. Reduced pump losses and the opportunity to improve utilisation will enable delivery of service more efficiently and effectively.

The ability to access data showing where pumps are and how they are being used provides the opportunity to improve both the NPWT clinical process and the equipment management process. Significant benefits to patients and to Barts Health's cost base are expected.

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CONFLICT OF INTEREST

No funding was provided to Barts Health or its personnel for conducting this study. One author is an employee of Smith & Nephew. Apropro are independent consultants funded by Smith & Nephew to conduct the evaluation.

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