

Negative pressure wound therapy in the acute care units of the Mendrisio Regional Hospital: results of a clinical audit

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ABSTRACT

During last twenty years, tailored technologies were spread and improved; they are aimed to support the treatment of difficult-to-heal wounds, such as negative pressure wound therapy (NPWT). This type of treatment lead to promote healing process and to reduce hospital stay of patients. In an acute care setting, planning and managing these new technologies represent a key-point. We did a retrospective study about NPWT in acute care setting in Beata Vergine Regional Hospital in 2017, aimed at performing a clinical audit; the results were compared to scientific literature to detect differences in daily clinical practice. Audit is a very helpful tool for Clinical Government: this method leads to improve the management of clinical activities because the entire staff (physicians and nurses) obtains important data about care setting. Patients treated by NPWT are usually difficult to treat and need a correct assessment and a multidisciplinary approach. Consequently, fundamental aspects are represented by nursing staff education and its relationship with medical staff, data collections and computer-assisted technologies development. Significant scientific literature and clinical experience seem to recommend a nursing management of NPWT patients. This aspect is very interesting and it can be improved by specific education, adequate organization and correct data collection.

INTRODUCTION

Nowadays elderly population is submitted to extreme surgical operations and other complex therapeutic treatments. Among pathological conditions, difficult-to-heal wounds often present challenging situations.¹

Most wounds are characterized by a rapid healing process; sometimes several patients suffer of chronic wounds, not spontaneously healed, with high rate of complications, such as infection or sepsis, that is a life-threatening condition. There is a great amount of scientifically tested data about the impact of chronic wounds on quality of life and on economic aspect of patients' management.²

During last twenty years, negative pressure wound therapy (NPWT) spread in clinical practice for the treatment of difficult-to-heal wounds. This kind of treatment revealed positive effects on patients' management and healthcare organization.¹

NPWT, also named vacuum-assisted closure (VAC), that is first KCI registered trademark, is a system characterized by dressings put on wounds and connected to a continuous or intermitted negative therapy to improve healing process, with well-known mechanisms.³

Since 90s, NPWT use represented a valid innovation in the treatment of difficult wounds. Initial contraindications were infection, exposition of arteries, veins, nerves, anastomosis or vital solid organs, tumours.⁴

After KCI's patent finished, many companies did negative pressure pumps to gain commercial benefits. For this reason, the system can be named variously by different companies: VAC, topical negative pressure, local hypobaric therapy.⁵

Local effects on wound

The local effects on wounds are: i) wound retractions, for mechanical effects on wound edges; ii) granulation tis-

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sue stimulation in an ideal wet condition; iii) mechanical debridement of wound bed with necrotic tissue removal; iv) metalloproteases reduction in exudate removal with reduction of dressings; v) safe and continuous exudate removal with reduction of dressings; vi) interstitial oedema reduction with consequent improvement of local vascularization and oxygen release.

Wound management

It is based on the following principles: i) protection against bacterial infection, especially multi-resistant drugs microorganisms (closed system of dressing); ii) transparency of wound coverage: polyurethane permits a clinical monitoring of perilesional skin conditions; iii) smell control: continuous exudate removal determinates improvement of local maceration.

Patient's comfort

The most important aspects are represented by: i) early mobilization; ii) clean, dry and odourless dressing.

The most important indications of NPWT are:^{3,4,6} i) surgical wound, infected or infection-risk (pNPWT o ciNPWT); ii) open abdomen; iii) surgical wound dehiscence; iv) burns; v) venous ulcers, diabetic foot ulcers, sores; vi) highly exudative wounds; vii) to prepare wound bed to skin graft; viii) to improve flaps or skin graft healing.

Nowadays NPWT is applied on patients of all ages (from infants to oldest patients), in severely complicated open abdomen and, however, it represents also a bridging therapy to prepare wound bed to receive skin grafts or flaps.⁴

NPWT is usually applied in *Ente Ospedaliero Cantonale* (EOC), that includes Beata Vergine Regional Hospital (OBV), localized in Mendrisio (Canton Ticino, Switzerland). Treatment costs are calculated according to Swiss Diagnosis Related Group (SwissDRG).

This type of patients represents usually difficult clinical cases, characterized by multiple diseases (cardiovascular diseases, diabetes, immunological diseases, tumours, geriatric conditions, bone diseases) that need a multidisciplinary approach.⁷

Evolution of healthcare technologies increased the treatment of chronic, fragile, severely compromised patients.⁸

In daily clinical practice, NPWT treatment requires dedicated medical and nursing staff with specific know-how. Specifically, in our Institution we can observe: i) dressings applied in the operating theatre or at patient's bed under medical supervision; ii) dedicated nursing staff with adequate training (four hours specific course); iii) documents to illustrate NPWT system, the pump function and alarms in each ward; iv) disposable materials in each ward; NPWT pump and other materials only in surgical ward.

For these reasons, we did a clinical audit regarding NPWT application in OBV aimed to identify features to: i)

improving patient management treated by NPWT; ii) facilitating NPWT application; iii) making NPWT application uniform in OBV; iv) reducing waste resources; v) improving satisfaction by patients and caregivers; vi) working according to efficacy, efficiency and adequacy principles.

MATERIALS AND METHODS

The OBV in Mendrisio is a public hospital localized in Southern part of Canton Ticino (Italian part of Switzerland) and it is one of regional hospitals included in the EOC. Healthcare services take part of a wide healthcare offer proposed by all hospitals of EOC. Thus, every patient is submitted to a correct multidisciplinary approach: OBV plays a key-role in healthcare support of Mendrisio District. In OBV, NPWT treatment is applied both in hospital setting and in outpatient regimen.

We did a clinical audit: specifically, we revised all clinical data about patients submitted to NPWT treatment from January 1, 2017, to December 31, 2017. We collected data about age, diseases, NPWT time, NPWT treatment management, data collected by nursing staff.

When done well, clinical audit has provided a way in which the quality of the care can be reviewed objectively, within an approach that is supportive and developmental.⁹

Actually, we did a retrospective analysis of these NPWT patients by creation of a dedicated file, managed by a Specialist Nurse in Surgery Department and according to privacy respect. This procedure was authorized by a Surgeon with adequate experience in Wound Care and by a Nursing staff director. In conclusion, this retrospective study was authorized by hospital General Direction. We collected 47 cases and we calculated 542 days of NPWT treatment in 2017. Consequently, we can consider that we treated about one patient per week with NPWT during 2017.

RESULTS

Documents examination revealed that during 2017 NPWT duration was totally 542 days with 47 disposable systems. Most cases the treatment had a duration <20 days with average value of 11,53 days (Figure 1A). Age ranged between 61 and 90 years old in 83% of cases (Figure 1B). Patients with NPWT presented various concomitant diseases: average value was 4,5 diseases, that were metabolic conditions (diabetes, obesity) in 42% of patients and cardiovascular pathologies in 45% of cases (Figure 2A). 60% of patients was in anti-platelets or anti-coagulation therapy, but no haemorrhagic events were registered during NPWT treatment (Figure 2B).

Most frequent treated lesions were on lower limbs (89% of cases), rarely on upper limbs or head (Figure 3A). Aeti-

ology of treated lesions was diabetic, post-surgical or neoplastic (Figure 3B). In the last case NPWT was done only after histopathological confirm of radical removal of tumour (R0 resection) and it was finalized to promote reconstructive surgical plan by skin grafts or flaps (40% of patients). In 66% of cases a pressure range between -125mmHg and -130 mmHg was applied and it never was <-150 mmHg or >- 75mmHg (Figure 4A). Moreover, retrospective analysis revealed incorrect registration of some data by nursing staff, considering also that a lot of information needs to be inserted manually. Specifically, as regard as clinical course data were correctly collected in 80,8 % of cases, while accuracy was 40,42% concerning applied pressure annotation (Figure 4B). These results revealed that improvement of continuous training and empowerment of standardized therapeutic protocols will be necessary.

DISCUSSION

NPWT impact on quality of life represents an important feature to be verified in targeted therapy valida-

tion;¹⁰ quality of life improvement obtained by NPWT is fundamental to have better outcomes, healthcare performance and patients' satisfaction rate.⁸ Moreover, other aspects have to be considered: wound healing phase, malnutrition, altered oxygenation, vascular diseases, diabetes, smoke, obesity, foreign bodies, infection and low haemoglobin levels.¹¹ An adequate caregivers and patients training are strongly recommended, particularly as regard as NPWT function and management, during hospitalization and before discharge. For this reason, giving an illustrated brochure about NPWT device and alarms can be useful. Patients and their relatives have to be informed about NPWT management and receive contacts' hospital staff for emergencies.¹² NPWT prescription is a medical competence, but next management can be done by trained nursing staff. Training programmes are usually organized with physicians, nurses and NPWT companies;¹³ trained staff, correct indications and technologies quality are the most important aspects to obtain a high compliance by patients.¹⁴

After discharge, efficacy and safety of NPWT are

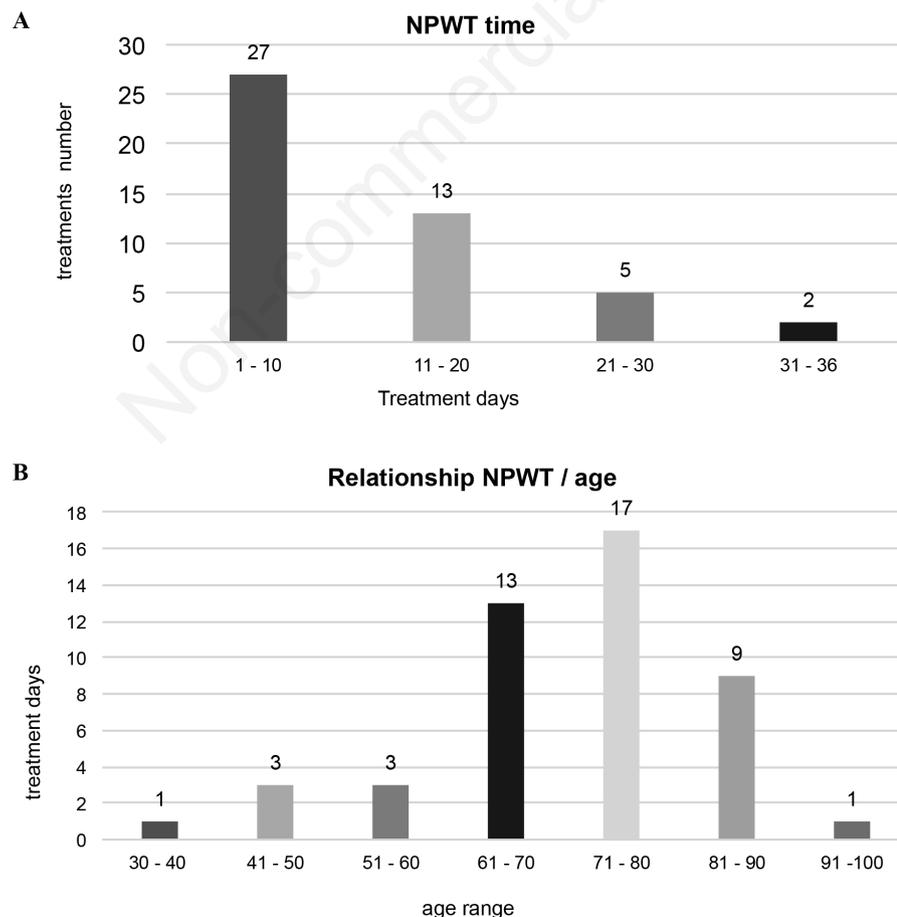


Figure 1. A) Negative pressure wound therapy (NPWT) treatment time. B) NPWT/age range.

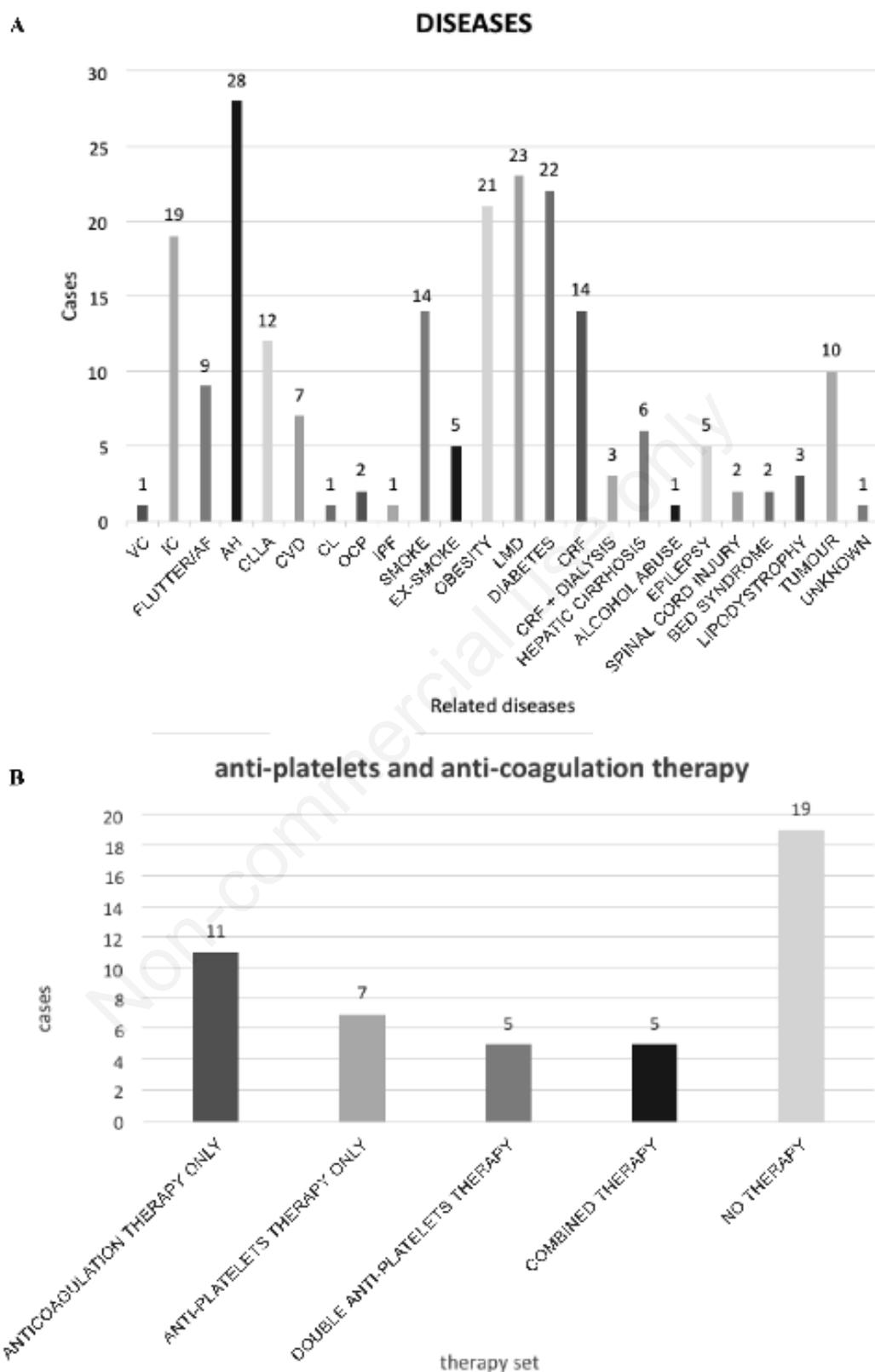


Figure 2. A) Co-morbidity. B) Therapy (drugs). VC, valvular cardiomyopathy; IC, ischemic cardiomyopathy; Flutter/AF, Flutter/atrial fibrillation; AH, Arterial hypertension; CLLA, Critical lower limb arteriosclerosis; CVD, Chronic venous disease; CL, Chronic lymphedema; OCP, Obstructive chronic pneumopathy; IPF; Idiopathic pulmonary fibrosis; LMD, Lipid metabolism disorders; CRF, Chronic renal failure.

guaranteed by a correct treatment planning.¹²⁻¹⁵ Thus, communication and relationship between physicians, nursing staff, patients and caregivers are based on scheduled clinical examinations and lesions' photos. All data must be collected in dedicated files, with support of diagrams, flow-charts, photos, clinical data, therapy annotations;¹⁶ these documents improve multidisciplinary approach, clinical research, economic resources management and they are useful for legal aspects too.¹⁵

CONCLUSIONS

During 2017, in Mendrisio OBV, average use of

NPWT was 1,5 treatment per day. For this reason, we promoted some specific procedures to improve safety and efficacy of this treatment: i) specific training for nursing staff, with scheduled up-to-date; ii) designation of a treatment leader to support the NPWT use in the hospital and individuation of one healthcare figure for NPWT in each ward; iii) creation of a digitalized document, easy to download by each computer in the hospital. This document underlines the most important aspects of NPWT; iv) improvement of digitalization of clinical documentation: specifically, making easier data collection/transcription and graphical annotation of NPWT problems is necessary.

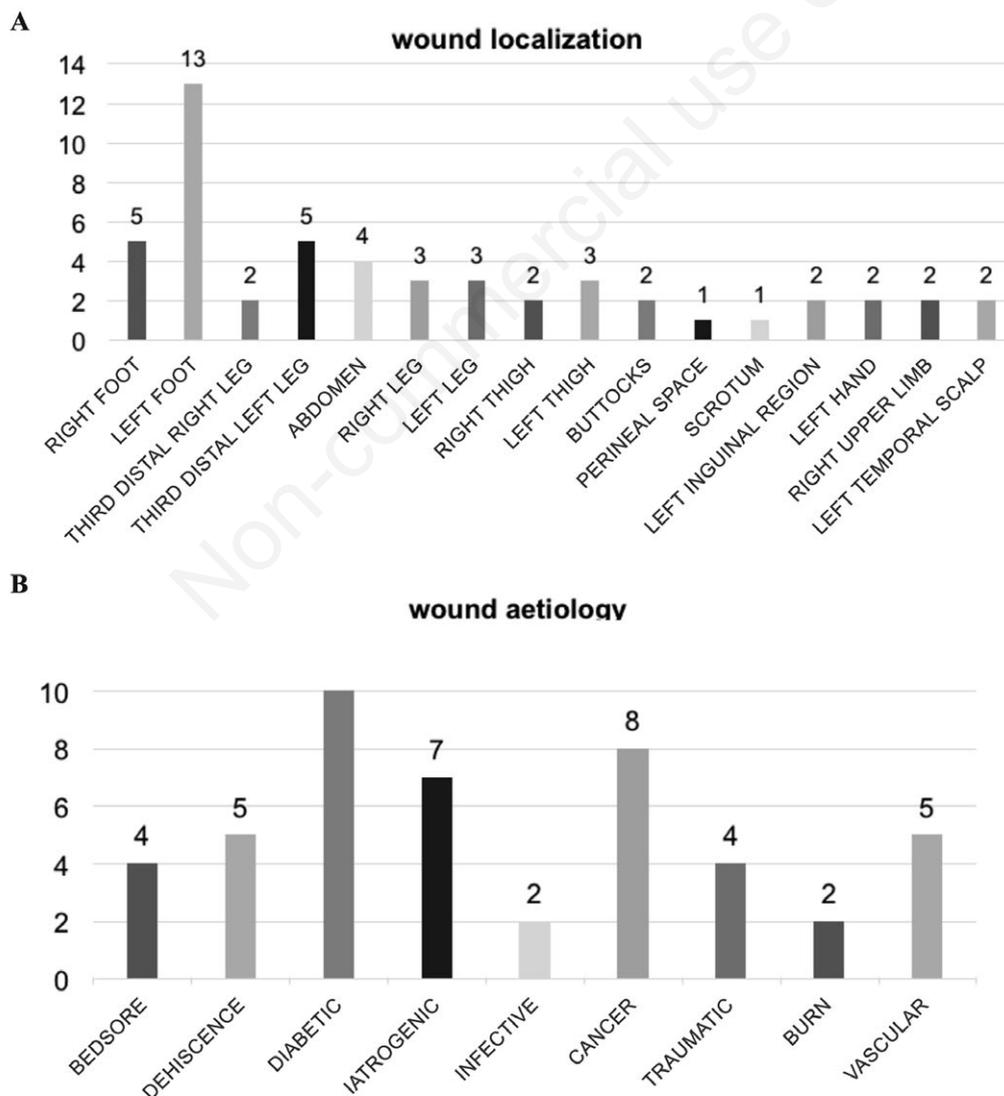


Figure 3. A) Wound sites. B) Wound aetiology.

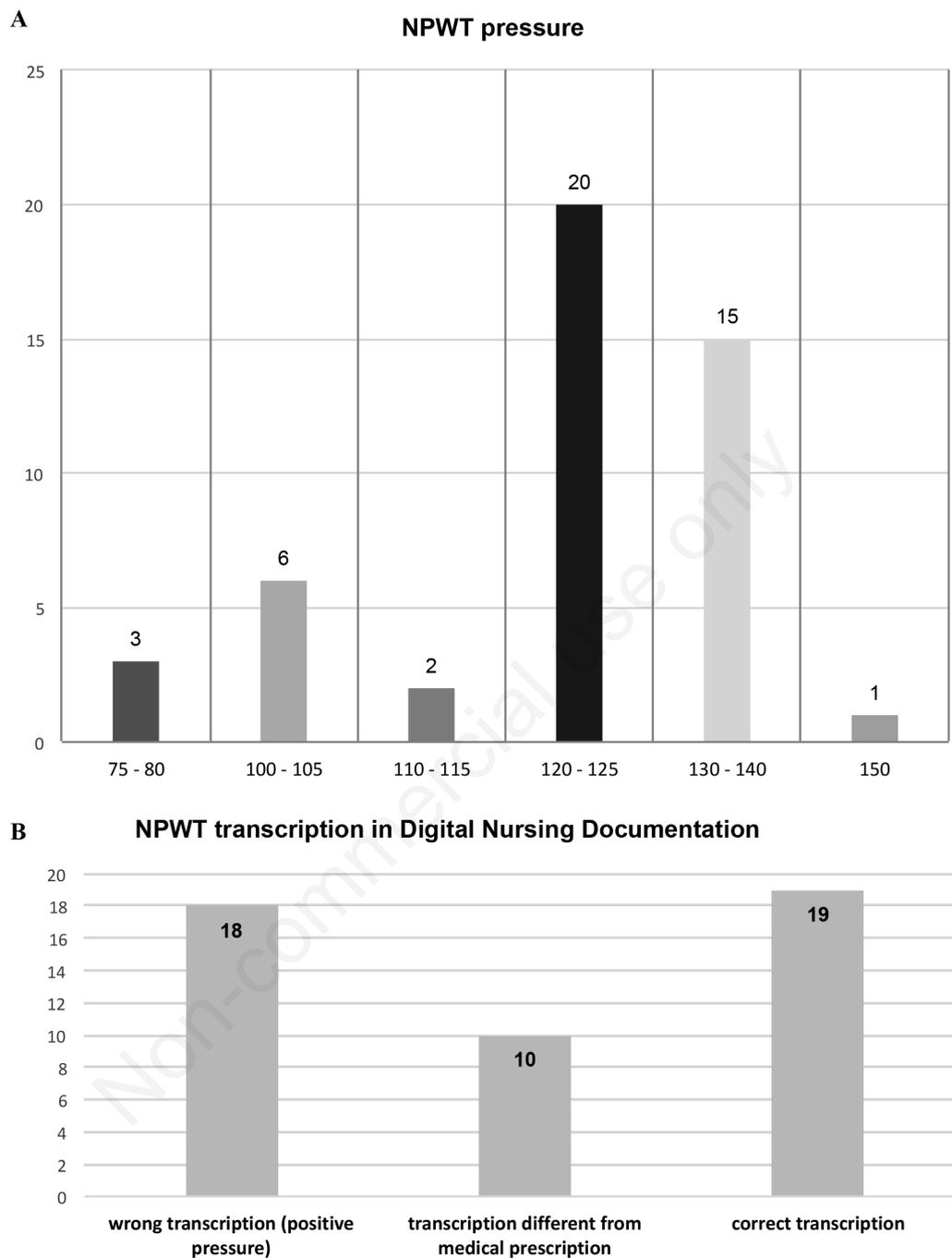


Figure 4. A) Pressure values. B) Digital data. NPWT, negative pressure wound therapy.

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