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## A Personal View on Wound Bed Preparation Based on Evidence

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### **1. My Approach to Managing Wounds that are Classified as Either Healable, Non-Healable or Maintenance and Some Comments on the Differences of Care Approaches between these Classifications**

When a patient with a chronic wound has been referred to me, a chain of thoughts and processes will be immediately initiated. As my approach to patients will always be holistic I will try to fully investigate the origin of that wound including the underlying cause. A systemic disease, which may have influence to origin and treatment needs assessment and then optimization, if not yet achieved. Co-factors have to be identified and then the actual wound can be assessed and graded. This may take more than one visit, but time is a powerful help in estimating the patient's actual circumstances. Only then an individualized **Plan of Care** may be set up, which consists of multiple facets like treatment of cause, treatment of pain, addressing factors, which delay or prevent healing, educate the patient's circle of care and turn to local wound care.

The systematic approach is set up two steps:

- A. Assessment, investigation and evaluation of the individual status
- B. Individualized plan of care, which consists of many facets

During the initial assessment of a new patient many specifics of this patient need to be identified and graded regarding the need for further investigations. I would always like to establish a strong bond with my patients and their circle of care right from the beginning to ensure their support. In fact, I strongly rely on the idea of the **4 E** model: Engage, empathize, educate and enlist, it is the basic in my patient care not only in wound care, but all patient care. Reviewing this patient includes history and physical, social, work and family history, identifying the underlying cause for the chronic wound – the actual diagnosis: like impaired blood supply, uncontrolled metabolic conditions like diabetes or hyperlipidemia, gout or acidosis, anemia, uncontrolled hypertension or chronic heart failure. Advanced assessment then will incorporate the patient's nutritional status, co-morbidities, prior surgeries and allergies, current medications and psycho-social status. The patient needs to have time to verbalize his worries, his anxieties, his hopes or lack of hopes for improvement. We need to grade his

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level of pain and the effects of having a chronic wound on his activities of daily living, in summary holistically “**get to know**” the patient.

Now we will turn to the actual chronic wound and establish a staging:

- It will be healable if adequate blood supply exists and the above-named factors can be correctly identified and successfully addressed in favor of wound size reduction of 30% over the first 4 weeks to heal within 12 weeks.
- It will be non-healable if the underlying condition of the patient is not treatable, the blood supply cannot be improved and/or the co morbidities do not favor wound healing.
- It will be maintenance status if the blood supply is adequate, but the underlying cause and/or co morbidities cannot be addressed successfully. Changing the settings may change the staging to healable.

Step 2 summarizes the above and leads to an individualized **Plan of Care**, based on a holistic approach and incorporating the patient’s concerns. The main focus goes of course to treating the underlying cause. But it is as important to identify the cause of the chronic wound, as it is to be aware of all factors within and around the patient, which may interfere with the healing.

No sophisticated treatment can succeed, if this basis is at lack. This leads to five trains of processes:

1. Treatment of the underlying direct cause of the wound – this includes addressing impaired blood supply, pressure redistribution, compression therapy, anti-infective therapy
2. Modification of unfavorable systemic conditions, as anemia, diabetic control, infections, nutrition and heart failure
3. Treatment of pain, help with activities of the patient’s daily living, psychosocial support, smoking cessation and evaluation of possible financial support and access to regular health care
4. Education of the patient’s circle of care, which helps to empower the patient and his family or caregivers and improve adherence to therapy and accountability
5. Local wound care according to international guidelines and evidence-based medicine – documentation of the current status and changes with time, measuring the size, describing exudate and appearance, grading the level of pain, finding undermining areas, reevaluating and looking at the wound edges. According to the NERDS and STONEES local or systemic anti-infective therapy has to be initiated, the wounds are gently cleansed, debrided as needed and proper pre-procedural pain management should be in place.

Very important in all of the wound care management is the interdisciplinary and inter-professional addressing of the patient’s condition.

Nobody wins alone, but the team can get us there!

## **2. How can We Distinguish a Superficial Infection from a Deep Infection? What Tool has Validated Evidence to Differentiate Between the Two?**

To distinguish between superficial infection and deep tissue infection we use the mnemonic **NERDS** and **STONEES**. These two define the signs of infections clinically to be observed, documented and if found as a group - minimum of three positives signs, to culminate in anti-infective treatment; either locally or systemically. Starting with the **NERDS**:

**N** stands for non-healing or stalled decrease in wound size from one visit to the next.

**E** stands for increased exudates

**R** relays to increased redness and friable tissue within the wound itself

**D** stands for increased debris and slough

**S** relays to increased odour and smell

International studies have shown, that any three positive signs of this group indicate a highly relevant prediction for local wound infection with a sensitivity of 45-82 % and a specificity of around 65-85 %.

**STONEES** are defined as the following:

**S** stands for increase in size of the wound

**T** relays to increased skin/tissue temperature

**O** relays to positive probing of bone or actual breakthrough of bone to the surface of the wound

**N** stands for new tissue breakdown and worsening wound conditions

**E** relays to increased exudate as in **NERDS**

And **E** relays to increased erythema and redness of the skin surrounding the wound and tissue within the wound

Finally, **S** stands for increased odour or smell, again as in **NERDS**

The sensitivity for positive prediction of deep tissue infection via **STONEES** with three signs ranges around 90% and a specificity of around 82%.

Both - sensitivity and specificity - may be even more powerful predictors in the presence of four signs of each group. The advantage of this tool lies in its simplicity. Primary care givers, nurses and even family members along with the patient himself may easily be trained to observe and document and list any of these signs and to present them to the responsible wound care team at the earliest availability, once they become positive as a group of three or more signs.

Center of all successful wound care management remains though the close observation, the empowering of the patient including his circle of care and the close connection to at least one member of the wound care team to allow for early interventions. As chronic wounds are usually found in patients with chronic conditions, exacerbations of the underlying comorbidities may easily lead to intermittent worsening of the wound. Distinguishing between superficial colonization leading to an increased burden for the host with a response showing insufficient capability to continue healing from a deep tissue infection, where the changes in physical characteristics require a systemic treatment to avoid possible systemic affection and septicemia is crucial and yet can be achieved via use of this easy tool. **NERDS** and **STONEES** make it easy to classify negative characteristics of a chronic wound and initiate the appropriate treatment accordingly.

### **3. What is the Relevance of Sterile vs. Clean Technique and Other Infection Control Challenges in the Management of Chronic Wounds Across Various Practice Environments?**

By reading the articles of Crow, Thompson and Barber, which all date back some time and reflect on studies, which are dated back even further, I wondered what, if anything may have changed in the minds of wound care nurses and regular nurses and

practitioners and physicians since then. I searched through some newer studies on the internet, but all more or less touched the same, that there are some governmental guidelines, but little evidence of worldwide consensus in the matter of what is best for the patient's outcome. And I have to conclude, from what is practiced at SKMC and what we have practiced back in Germany, and what I have observed in the UK - there simply is no one way of changing dressings within any culture nor across.

Probably what remains the foremost important thought is to keep harm away from the patient by all means. Clean versus sterile technique of changing dressings: first one has to differentiate between the two and define each. Then one may review outcomes and refer to governmental guidelines and local policies. In the third step one would then review, what is the common practice, and does this differ from what is recommended in guidelines and policies. Finally one has to decide how to educate adult practitioners and nurses to change their behavior or adapt to the results of newest evidence.

Sterile change of dressing should be done in clean rooms, well prepared and equipped, so that the care giver can reach everything needed sterile, while wearing sterile gloves and having nobody to assist. To ensure successful avoidance of cross-infection in either way – wound to care giver or vice versa, one needs training and understanding, of the process. Once that has been learnt, everybody needs discipline to stick to this process. And here is where most mistakes are made. Management of chronic wounds as many other tasks within the daily duties of health care providers depends on each individual to stick to, what he/she has learnt and to keep up the discipline in spite of work load, lack of time and resources. In fact there are numerous guidelines as to what level of cleanliness versus sterility is advised for different steps in wound care management – from irrigation to dressing change to surgical debridement, the outcome must achieve aseptic status.

Now what is asepsis in an infected chronic wound? Actually asepsis refers to the technique to strictly avoid cross contamination or exchange of any microbes between the patient and the care giver. To prevent any infection of the existing wound by the person changing the dressing or managing the wound at its current status, we need to ensure, that these details and principles have been incorporated into our daily practice. In other words the whole condition of that patient with all co-morbidities, abilities to cope or not cope, support or not support healing must be included, while planning the procedure. As important is to plan ahead, specify time and prepare all items needed – before opening sterile gloves and materials. I fully support, that the holistic recognition of each individual marks a very important part, when organizing the chronic wound management, the other is the proper training of the care giver and upheld discipline to stick, to what one has learnt. Of course updates according to newest guidelines and results of evidence based trials must not be ignored. Relearning known processes with modifications actually can magnify the knowledge base of the health care team.

#### **4. Now How Would We Approach a Comprehensive Assessment of Pain for a Patient with a Wound?**

First and foremost - any patient needs to be assessed systematically, but individually. As the patient may present with a wound and pain, or pain due to a wound, or pain due to an underlying metabolic disorder or condition, aggravating his general perception of pain, only systematic assessment can direct the way. Still conclusions as to how this condition is managed best will only be derived, once the patient is understood. And this is my duty as the treating physician to listen carefully and try to understand the patient's needs, feelings based on past experiences - good or bad - way of thinking and willingness to engage, before I can discuss a specific plan of care. Comprehensive assessment will be based on the actual

complaint leading the patient to attend my clinic or being admitted, the past medical history, the family and social history and his psychological status including his perceived level of pain, when examining during the physical. Current drug therapy including allergy is important to be known, before new analgesics or a mediator drugs can be introduced.

Now I get to the analysis of the actual complaint and the pain and psychological stress the chronic wound may induce in this patient. Listening to her/his experiences and suffering enables me to understand and her/him to share her/his burden. Teaming with the patient and including the multidisciplinary team, adding the family members close to him will create a circle of care, in which the patient can reliably concentrate on being cared for and engage in his own well-being. Understanding the cause of pain itself is most important to address the multiple ways to manage pain or at least reduce pain to the level of being tolerable.

Pain can be cyclic – i.e. with each change of dressing, or whenever a patient has to lean on tissue, which is wounded during transfers or in the bathroom, pain can be noncyclic or incidental, whenever wound debridement happens. But of course each chronic wound itself, sometimes just by the look of it may cause chronic barely bearable pain. One may believe that the human mind gets used to everything and the levels of pain diminish in time, but in fact studies have shown, that the opposite is the case. If pain is not addressed appropriately by the health care professional, the sensation of pain burns a permanent memory into the brain and reinforces itself, every time the wound dressing is being changed or the wound is debrided or inspected. Some cases report of patients suffering from the wound pain, when the actual ulcer has long healed. Experts call this whole triage the chronic wound pain experience. The above named approach explains, why in management of chronic wounds the inter-professional and interdisciplinary wound care teams are needed and in retrospect provide the best management with the highest rate of success, even if not in healing at least in addressing the patients in a holistic way to take care of the wound, his nutritional needs, his psychological support, his pain management and other underlying conditions. Some wounds may only become healable when pain is decreased or gone and the patient can direct his efforts to supporting the medical needs to heal, or simply saving all his courage to consent to the urgently needed surgical debridement, which in fear of pain, he refused before. In regards of the lessons learnt I strongly support the chronic wound associated pain model as part of the chronic wound experience, as the former analyzes the causes and quality of pain in a flow chart, where inadequate management of the wound causes more pain and taking patient's centered concerns into consideration results in much happier patients with reduction in incidence of chronic pain syndromes, depression and higher rates of pain reduction. The later expands the course of wound management into a flow, where constant re-evaluation helps to identify pain and its level and its cause and how to reduce each by being aware, what causes it and how to prepare to cope with it. Studies then have proven, that proper management of pain can increase adherence to advised therapy and transform maintenance wounds into healable wounds

## **5. When Using Advanced Modalities, How Do We Approach the Issue of Right Patient for the Right Treatment Selection?**

Negative Pressure Wound Therapy (NPWT), Electrical Stimulation, Hyperbaric Oxygen Therapy, Ultrasound or Ultraviolet Light.

The common recommendations by American and European Wound Care Societies are not yet fully supportive and request further and expanded patient numbers to advise the generalized use of advanced modalities in management of chronic wounds. My personal approach to patient selection for any of the modalities would exclude all patients, who do not connect with their body and diagnosis and expect the wound care team to deal with his body, while he lives on. Secondly all patients with underlying malignant tumors would be excluded for the risk of enhancing tumor growth. And likewise patients with insufficient support within their circle of care may not be suitable, as most of the named advanced modalities require correlation of dressings, appointments, engagements and reliability with the actual technique. Having written that, at this stage I am still open for suggestions, but would be very reluctant to consider the extra step of advanced modalities in most of my patients for the following reasons: First all of them are co-treatments or supportive, but cannot at this stage be recommended as sole wound care management alternatives. Second all of them have been known for a long time, but none of them were able to successfully show consistent benefit, otherwise they would have been long time an essential part in our modern clinic setting. Newer meta-analysis suggests, there could be benefit, but the underlying effects are still under investigation or theories to be proven. Most of the generalized described effects can be found in any wound that has been given full attention. Thirdly as long as the resources in the health care sectors are not distributed evenly, support from insurance plans would be needed to allow a more broad entrance to recommended treatment schemes.

Nevertheless, there seem to exist a few individual patients, who benefit from different advanced modalities and have shown healing tendencies, where prior conservative management could not. These patients have to be selected carefully and then conveyed to the trained care giver applying them. Which of these techniques are better is not clear, as they have not been tested against each other. So it comes to the point, what is available, what is doable and what is fundable.

At the University of Hamburg in the Faculty of Medicine we have discussed Electrical Stimulation in wound healing in 1990, but somehow it never developed into anything more, either because of the lack of patient numbers or the lack of profound benefit to wound care team management, which as an inter-professional and interdisciplinary approach has succeeded much more impressively in reducing the time to heal and the suffering of patients world-wide. Hyperbaric Oxygen Therapy is the state of the art in clostridium perfringens and other anaerobe deep tissue infections to save limbs and lives, but it seems too complicated and expensive to be used on chronic ulcers, when equal effects can be achieved by mending the peripheral blood supply with the benefit of improving the oxygenation of the tissue even after the wound has healed and not only for the time the therapy lasts.

The newer machines to debride chronic wounds with ultrasound have been tested within our wound care team and results are very positive, so it remains part of our wound management, but it also remains the odd patient and not the broadly recommended treatment option. Ultraviolet Light Therapy is known to me as an essential part in managing different skin conditions, but I have no personal experience in wound care with UV light. On the contrary I can imagine that many multi-morbid patients with numerous medications will have at least one, if not more in their formula, where exposure to excessive UV light is forbidden or not recommended.

So I would stick to what I have experienced to be most effective in speeding up tissue growth in deep ulcers with large deficit of tissues, which would usually require months to be refilled by the patients, but can be provoked and sped up by Negative

Pressure Wound Therapy. At SKMC the wound care team reviews patients with chronic wounds regularly during our wound care team rounds and discusses the interdisciplinary problems, which have led to the non-healing or prolonged healing of certain wounds. During the rounds we may decide, that bed-side debridement is appropriate or that this patient need general anesthesia and need debridement in the OR. The next week we may decide to initiate NPWT, once the team identifies the absence of contraindications, like infections, lack of blood supply, unmanaged pain and close proximity to anus, skin malignancies or inadequate size of the wound. We have many individual patient observations and case studies, where over time and with dedication from family and home sitter or nurse miraculous healings – in fact an intact circle of care – healing of very difficult and complex wounds was achieved with the support of NPWT. Of course, this modality remains a part in the complex picture of options and specific needs, which must be met during the healing course to finally declare: **wound has healed.**