In the German health care system, the impact of wound care in terms of health economics still has not received the attention it deserves. Our expert explains, using current data, what is going wrong in the system and what measures he recommends for the future.

Wound care management in the German healthcare system is in need of improvement. This is shown on the one hand by the Rehabilitation and DIAgnosis-Related Study (REDIA study; cf. von Eiff et al. 2011), which for example proves that the number of orthopaedic patients with exposed sutures and wounds not closed has increased from 7 to 40 percent in the years from 2003 to 2011. The necessary quality of wound treatment is limited by interruption of the transfer process between discharge from acute treatment and admission to rehabilitation.

In direct transfers, increasingly complex wound care management is required. On the other hand, approximately four million persons in Germany suffer from chronic wounds (Fig. 1), and approximately 3.5 million are inadequately taken care of. Each year there are about 15,000 to 20,000 avoidable

**WOUND TYPES**
The three most common types of wounds are leg ulcers, pressure ulcers and diabetic foot ulcers.

<table>
<thead>
<tr>
<th>Wound Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg ulcers</td>
<td>1,230,000</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>1,640,000</td>
</tr>
<tr>
<td>Diabetic foot ulcers</td>
<td>656,000</td>
</tr>
<tr>
<td>Other wounds</td>
<td>492,000</td>
</tr>
</tbody>
</table>

*Figure 1: Distribution of the patients with chronic wounds broken down by wound type.*

**SOURCES**

- Arenbergerova M. et al. (2013) Einfluss von topischem Hämoglobin auf die Heilung von Patienten mit Ulcus cruris venosum, Der Hautarzt, 3 (64), 180–186
amputations, especially of the lower extremities. About 70% of patients with major surgery, e.g. foot amputations, require permanent care after the procedure. 22% of patients with major surgery die perioperatively.

A large part of the amputations and hence also of the amputation-related deaths could be avoided by appropriate wound care. These figures demonstrate an urgent need for action.

CAUSES FOR INAPPROPRIATE CARE

The main reasons for inappropriate management of patients with a wound are:

- unattractive remuneration in the independent practice sector in relation to the costs of care and materials;
- insufficient number of interprofessional wound networks;
- inadequate training concerning wound healing and management in the study of medicine and in continued medical education;
- unmanageable number of wound dressing products based on a plethora of different therapeutic approaches;
- hypoxia as the common aetiology of almost all chronic wounds is not addressed despite the large number of different wound bandages.

STANDARD COSTING

The standard calculation for determining the direct and indirect costs per dressing change shows advantages for combination therapy.

<table>
<thead>
<tr>
<th>Therapy approach</th>
<th>Staff costs (per dressing change)</th>
<th>Material costs (per dressing change)</th>
<th>Ø treatment time to treatment success (wound closure)</th>
<th>Total costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A conventionally dry</td>
<td>10.86 €</td>
<td>5.62 €</td>
<td>301 days</td>
<td>4,960.48 €</td>
</tr>
<tr>
<td>B hydroactive</td>
<td>10.86 €</td>
<td>9.67 €</td>
<td>92 days</td>
<td>809.47 €</td>
</tr>
<tr>
<td>C Granulox combination therapy</td>
<td>10.86 €</td>
<td>13.67 €</td>
<td>60 days</td>
<td>630.77 €</td>
</tr>
</tbody>
</table>

Preparation:
- Daily change of dressing in Setting A
- Dressing changed 3× a week in Settings B and C

Source: von Eiff, graphics: HCM

Figure 2: Standard costing of alternative therapeutic approaches (based on direct and indirect costs).

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The clinical and economic benefits of Granulox combination therapy could be demonstrated in numerous individual cases.

### Setting

<table>
<thead>
<tr>
<th>Patient:</th>
<th>♂</th>
<th>74 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underlying disease:</td>
<td>PAOD stage IV acc. to Fontaine</td>
<td></td>
</tr>
<tr>
<td>Wound:</td>
<td>Arterial leg ulcer on the left lower leg</td>
<td></td>
</tr>
<tr>
<td>Before Granulox therapy</td>
<td>Unsuccessfully treated for 74 weeks</td>
<td></td>
</tr>
</tbody>
</table>

### Costs per dressing

<table>
<thead>
<tr>
<th>Without Granulox</th>
<th>With Granulox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Price</td>
</tr>
<tr>
<td>Amorphous gel</td>
<td>1.36 €</td>
</tr>
<tr>
<td>Collagen</td>
<td>7.98 €</td>
</tr>
<tr>
<td>Superabsorbent</td>
<td>5.37 €</td>
</tr>
<tr>
<td>Total</td>
<td>15.79 €</td>
</tr>
</tbody>
</table>

### Calculation of the total treatment costs

- **Without Granulox:**
  - Duration of treatment: 74 weeks. Assumed dressing changes per week: 3
  - 74 weeks × 3 dressing changes per week × 15.79 € material = 3,505.38 €

- **With Granulox:**
  - Duration of treatment: 4 weeks. Assumed dressing changes per week: 3
  - 4 weeks × 3 dressing changes per week × 8.50 € material = 102.00 €

**Savings**

- Direct cost savings for 13⅓ dressing changes (9.67 € material + 11.00 € staff) = 274.91 €
- Extrapolated to 3,000 (similar) cases ≈ 824,730 €
- QALY outcome evaluation (31 days at 60,000 € / QALY = 5,096 €)

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### Refractory Wound

Even late therapy change to Granulox (setting C) increases the patient outcome and contributes to cost reduction (3 dressing changes per 7 days).

**Case Study**

<table>
<thead>
<tr>
<th>DFS interdigitally</th>
<th>301 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH II sin</td>
<td>91 days</td>
</tr>
<tr>
<td>♂, 85 years</td>
<td>210 days</td>
</tr>
<tr>
<td>Diagnosis: Diabetes mellitus, peripheral arterial disease Arterial hypertension</td>
<td></td>
</tr>
<tr>
<td>Previous therapy: (Setting B)</td>
<td></td>
</tr>
<tr>
<td>- Irulex ointment</td>
<td></td>
</tr>
<tr>
<td>- Alginate</td>
<td></td>
</tr>
<tr>
<td>- Hydrocolloid</td>
<td></td>
</tr>
<tr>
<td>- Polyurethane foam</td>
<td></td>
</tr>
<tr>
<td>Previous course of therapy</td>
<td></td>
</tr>
<tr>
<td>Therapy conversion to Granulox</td>
<td></td>
</tr>
<tr>
<td>Standard course of therapy</td>
<td></td>
</tr>
<tr>
<td>Therapy conversion to Granulox</td>
<td></td>
</tr>
</tbody>
</table>

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INNOVATIONS
The common cause of almost all chronic wounds is so-called hypoxia, i.e., lack of oxygen. This is not addressed by traditional wound bandages. This is the starting point for combination therapy with topical haemoglobin, which overcomes the hypoxia. In a prospective, randomized study (Arenbergergerova 2013) the medical efficacy of a combination therapy (here with the product Granulox) was compared to therapy without Granulox. The result was compared to the traditional treatment concepts (conventional dry therapy; hydroactive therapy).

It was found that conventional dry treatment on average takes 301 days until wound closure, hydroactive therapy 91 days and combination therapy 60 days. Particularly in the use for therapy-refractory wounds the combination therapy was found superior. The starting point of the health technology assessment carried out by the Centre for Hospital Management (CKM Institute) was the finding that the treatment of chronic wounds entails costs amounting to six billion euros.

The annual costs per wound for health insurance amount on average to 5,000 €.

ASSESSMENT IN TWO STEPS
The first step was a standard calculation based on the average times to wound closure, taking into account the fact that in the case of combination therapy only three dressing changes per week are needed (daily change with conventional dry therapy; Fig. 2). The second step was to measure the course of treatment, medical quality, direct and indirect costs and opportunity costs on a case-specific basis in randomly selected patients with wound care problems (Fig. 3). Combination therapy has proven its worth in therapy-refractory wounds (Fig. 4). Even if combination therapy is begun only 210 days after the start of a failed standard therapy, still up to 300 € per case can be saved, corresponding total savings of more than 800,000 € with 3,000 cases.

What was surprising was also the dimension of the consequential costs of insufficient wound management found: As few as 15,000 avoidable foot amputations impose a burden of 225 million € on the health insurance providers.

SUMMARY AND RECOMMENDATIONS
The superiority of combination therapy with topical haemoglobin in wound care, especially for therapy-refractory wounds, leads to the recommendation to spread the application of this procedure. Unfortunately it must be noted that independent practitioners are unsure whether the statutory health insurance providers absorb the costs of such services. Here the following must be noted: Granulox, the product underlying the combination therapy, is not a drug that must be separately approved to be included into the catalogue. Rather, it is a wound dressing that requires no specific approval since pursuant to § 31 I 1 of the German Social Code it must be reimbursed by the statutory health insurance.

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