

# Wound hygiene survey: awareness, implementation, barriers and outcomes

**Objective:** In light of the COVID-19 pandemic, which has resulted in changes to caseload management, access to training and education, and other additional pressures, a survey was developed to understand current awareness and implementation of the wound hygiene concept into practice one year on from its dissemination. Barriers to implementation and outcomes were also surveyed.

**Method:** The 26-question survey, a mixture of multiple choice and free-text, was developed by the *Journal of Wound Care* editorial staff, in consultation with ConvaTec, and distributed globally via email and online; the survey was open for just over 12 weeks. Due to the exploratory nature of the research, non-probability sampling was used. The authors reviewed the outputs of the survey to draw conclusions from the data, with the support of a medical writer.

**Results:** There were 1478 respondents who agreed to the use of their anonymised aggregated data. Nearly 90% were from the US or UK, and the majority worked in wound care specialist roles, equally distributed between community and acute care settings; 66.6% had been in wound care for more than 8 years. The respondents work across the spectrum of wound types. More than half (57.4%) had heard of the concept of wound hygiene, of whom 75.3% have implemented it; 78.7% answered that they 'always' apply wound hygiene and 20.8% 'sometimes' do so. The top three barriers to adoption were confidence (39.0%), the desire for more research

(25.7%) and competence (24.8%). Overall, following implementation of wound hygiene, 80.3% reported that their patients' healing rates had improved.

**Conclusion:** Respondents strongly agreed that implementing wound hygiene is a successful approach for biofilm management and a critical component for improving wound healing rates in hard-to-heal wounds. However, the barriers to its uptake and implementation demonstrate that comprehensive education and training, institutional support for policy and protocol changes, and more clinical research are needed to support wound hygiene.

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wound hygiene • biofilm • hard-to-heal wounds • global survey • implementation

Ongoing research in wound care management has brought many advances in dressing technology and best practice. At the same time, there is a growing, ageing global population with wounds who increasingly present with comorbid health conditions, thereby posing challenges to individuals and healthcare. These challenges include escalating costs to healthcare systems, disproportionate devotion of resources to wound care, increasing antibiotic usage during a time of global concern and, most importantly, decreased patient quality of life.<sup>1-13</sup> Effective strategies to expedite healing may benefit all stakeholders. Evidence is mounting that improving the management

of hard-to-heal wounds necessarily involves improving the wound microclimate, which includes addressing the tenacious biofilm that is present in most wounds.<sup>14</sup>

The underlying principle is that wounds that are not progressing towards healing as expected should not automatically be considered non-healing or termed 'chronic,' which may impart a message that the wound's condition is irreversible.<sup>15</sup> Use of the term 'hard-to-heal' is more likely to challenge providers to thoroughly address the cause of delay; it is a reminder that such wounds contain biofilm, which directly interferes with the speed of healing, and of the rapid speed with which wound biofilm reforms after removal.<sup>15</sup>

Comprehensive wound assessment remains imperative at every patient contact. All causes of delayed healing should be recognised, and the underlying pathology diagnosed and sufficiently addressed.<sup>15</sup> A new wound that exhibits increased exudate, slough and size by the third day of its occurrence may already be defined as hard-to-heal.<sup>15</sup> A new targeted approach to managing the biofilm of hard-to-heal wounds is required.<sup>15</sup>

To rethink what constitutes best practice in these wounds, given the importance of wound environment

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for success, an international consensus panel met in summer 2019 to discuss the structure and content of a new concept developed by the group: wound hygiene (Box 1). Based on the evidence and current state of practice, a well-planned and systematic approach to wound cleansing and decontamination is needed to prepare hard-to-heal wounds, to facilitate healing.<sup>16</sup> Biofilm management, a well-accepted concept in wound care, currently involves regular debridement followed by biofilm-inhibition strategies, including the use of topical antimicrobial dressings.<sup>14</sup> The consensus panel determined that there is a need to go further, adding two stages aimed at managing the biofilm early and repetitively, with some form of wound hygiene applied at every visit.<sup>15</sup>

The resulting four steps of wound hygiene are:

- Cleanse (both the wound and periwound skin)
- Debride (initial aggressive debridement if necessary, as well as maintenance)
- Refashion the wound edges
- Dress the wound with an antibiofilm dressing.

Wound hygiene can be used in combination with a global wound assessment framework such as TIMERS (tissue, inflammation, moisture, edge, regeneration/repair, social factors), which allows for the application of new concepts; the consensus panel posited that doing so is foundational for the effective management of biofilm on and around a wound.<sup>15,17</sup> Wound hygiene was developed as a protocol of care to be used on all wounds, including acute and postoperative, with flexibility to account for local standards and guidelines.<sup>15</sup> The concept is targeted at all healthcare professionals (HCPs), not just wound care specialists, empowering generalists and specialists alike to implement best-practice care.<sup>15</sup>

The resulting international consensus document, *Defying hard-to-heal wounds with an early antibiofilm intervention strategy: wound hygiene*, was published in March 2020. The consensus was complemented by a 50-minute educational webinar with 2,520 registrants, of whom 820 attended; there have been a further 796 on-demand views from 524 viewers. Further support was provided by 46 wound hygiene ambassadors from Australia, Canada, the Czech Republic, Ireland, Italy, Poland, Portugal, Spain, the United Kingdom and the United States. However, the consensus was published just as the COVID-19 pandemic entered the scene and disrupted healthcare. Just one study appears to have been published on the wound hygiene concept, with encouraging results:

- A retrospective, descriptive and analytic study at the Centro de Tratamiento de Úlceras y Enfermedades Venosas in Salvador, Bahía, Brasil on the use of a treatment protocol including wound hygiene on diabetic foot ulcers (DFUs) and leg ulcers, which found that wound healing rates improved after protocol implementation. The researchers achieved adequate control of local signs of infection and exudate, as well as reduction in visual and indirect

signs of biofilm, with all patients progressing well towards wound-size reduction and closure.<sup>18</sup>

In many places, the COVID-19 pandemic has resulted in changes to caseload management, access to training and education, and other additional pressures. A multidisciplinary group in Italy conducted a survey that reported that, due to the pandemic, only 22.6% of cases attended the wound clinic as usual.<sup>19</sup> In Germany, the 'pandemic impaired access to clinical management of chronic wounds', and solutions such as telemedicine were not employed to ensure continuity of care.<sup>20</sup> Under the strictest lockdown in South Africa, 'Patient visits virtually came to a halt' and patients delayed care, sometimes for months; in many cases, digital and telephone consultations have been deployed to continue treatment.<sup>21</sup> A survey based in the United States found that more than 40% of respondents' wound care practices were closed for part of 2020.<sup>22</sup>

In light of the extended impact of the pandemic, the described survey was commissioned to understand awareness and implementation of wound hygiene, as well as barriers encountered and outcomes achieved, one year on from the dissemination of the concept.

## Methodology

*Journal of Wound Care (JWC)* was commissioned by ConvaTec to develop and conduct an international survey of HCPs involved in wound care, to seek their views on wound biofilm and non-healing, their assessment and management of wound biofilm, their awareness of the wound hygiene concept, and, if relevant, how they implement it and outcomes to date. The 26-question survey, a mixture of multiple choice and free-text questions (Table 1), was developed by *JWC* editorial staff in consultation with ConvaTec. The authors reviewed the survey outputs to draw conclusions from the data, with the support of a medical writer.

Non-probability sampling was used, due to the exploratory nature of the research: that is, the sample was selected based on non-random criteria, and not every member of the population had a chance of being included. Furthermore, no prior research on the clinical practice of wound hygiene has been published. Participation was voluntary, carried out online and anonymous to the *JWC* staff, sponsor and authors, to encourage a broad range of views and ensure reliability of results.

An Alchemer link was distributed via email to 97,000 members of *JWC*'s database, as well as via social media posts and a pay-per-click campaign. Five reminder emails were sent to individuals in the database, to increase the response rate. A free three-month subscription to *JWC* was offered as an incentive for completing the study; this information was blinded to the *JWC* editorial team and authors, and governed by *JWC*'s editorial policy, to which all those who provided personal details consented. The survey was open from 14 December 2020 to 4 March 2021.

The survey was designed to allow anonymised

**Table 1. The survey questions**

<p>Q1 How would you describe yourself?</p> <ul style="list-style-type: none"> <li>• Specialist practitioner in wound care?</li> <li>• Generalist practitioner?</li> <li>• Other (please specify)</li> </ul>	<p>If yes, please go to Q8 If no, please go to Q12</p>	<p>Q16. If no, is this because (you can tick more than option):*</p>
<p>Q2 How long have you been managing wounds?</p> <ul style="list-style-type: none"> <li>• Less than one year</li> <li>• 1–2 years</li> <li>• 2–4 years</li> <li>• 4–8 years</li> <li>• More than 8 years</li> </ul>	<p>Q8. What do you consider to be the clinical indicators of wound biofilm? (you can tick more than one)</p> <ul style="list-style-type: none"> <li>• The wound surface is shiny and slimy</li> <li>• The wound is producing copious slough</li> <li>• The exudate level is increasing</li> <li>• The wound is not responding to appropriate antibiotic treatment</li> <li>• The wound is not responding to antimicrobial dressings</li> <li>• The surrounding skin is red and warm, the wound is producing a purulent discharge, there is new or increasing pain, there is more malodour and the wound is not healing as expected</li> <li>• The wound is showing subtle signs of chronic inflammation</li> <li>• All hard-to-heal wounds contain biofilm</li> <li>• Don't know</li> </ul>	<ul style="list-style-type: none"> <li>• The concept of wound hygiene is too difficult to understand</li> <li>• You do not feel confident to implement wound hygiene independently without further training and supervision</li> <li>• You do not feel competent to implement wound hygiene independently without further training and supervision</li> <li>• You do not have time to implement wound hygiene on each patient with a hard-to-heal wound</li> <li>• You require more research evidence on the efficacy of wound hygiene before you will implement it</li> <li>• Implementing the concept of wound hygiene would be too much of a culture change</li> <li>• You do not think patients will not consent to wound hygiene</li> <li>• You do not think wound hygiene will be effective</li> <li>• Other (please express in your own words)...</li> </ul>
<p>Q3 What setting do you work in?</p> <ul style="list-style-type: none"> <li>• Acute care</li> <li>• Community care</li> <li>• Other (please specify)</li> </ul>	<p>Q9. Do you use an antibiofilm strategy to manage biofilm in wounds?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Don't know</li> </ul>	<p>Q17: Have you implemented wound hygiene as part of a multidisciplinary team?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
<p>Q4 What type of wound do you manage (you can tick more than one answer):</p> <ul style="list-style-type: none"> <li>• Pressure ulcers/pressure injury</li> <li>• Venous leg ulcers</li> <li>• Arterial leg ulcers</li> <li>• Diabetic foot ulcers</li> <li>• Traumatic wounds</li> <li>• Open surgical wounds</li> <li>• Non-healing dehisced surgical wounds</li> <li>• Mixed aetiology leg ulcers</li> <li>• Other [please specify]</li> </ul>	<p>Q10. Please describe the antibiofilm strategy you use</p>	<p>Q18. How frequently do you apply wound hygiene to your patients' wounds?</p> <ul style="list-style-type: none"> <li>• Always</li> <li>• Sometimes</li> <li>• Rarely</li> </ul>
<p>Q5 Based on your caseload, in the past 6 months what percentage of the wounds that you have managed did not respond to treatment as expected:</p> <ul style="list-style-type: none"> <li>• 0–10%</li> <li>• 10–20%</li> <li>• 20–30%</li> <li>• 30–40%</li> <li>• 40–50%</li> <li>• 50–60%</li> <li>• 60–70%</li> <li>• ≥70%</li> </ul>	<p>Q11. Do you think that effective management of wound biofilm is likely to accelerate healing:</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Don't know</li> </ul>	<p>Q19. What wound types have you applied wound hygiene on (you can select more than one):</p> <ul style="list-style-type: none"> <li>• Pressure ulcers/pressure injury</li> <li>• Venous leg ulcers</li> <li>• Mixed-aetiology leg ulcers</li> <li>• Arterial leg ulcers</li> <li>• Diabetic foot ulcers</li> <li>• Traumatic wounds</li> <li>• Open surgical wounds</li> <li>• Non-healing dehisced surgical wounds</li> <li>• Other [please specify]</li> </ul>
<p>Q6 What do you think are the main reasons for this? (you can tick more than one answer):</p> <ul style="list-style-type: none"> <li>• Patient did not comply with the management plan</li> <li>• There are challenges accessing advanced dressings (eg, due to local formulary or guideline restrictions)</li> <li>• Your qualifications, role or competencies restricted the wound management regimen that you could implement</li> <li>• The wound deteriorated or dehisced due to the onset of local infection</li> <li>• Long-standing wounds are very hard to heal</li> <li>• The underlying aetiology was difficult to manage</li> <li>• Standard of care was not applied</li> <li>• Involvement of different disciplines in the patient's care resulted in the application of a variety of dressings</li> <li>• The presence of biofilm in the wound acted as a barrier to healing</li> <li>• Don't know</li> </ul>	<p>If yes, go to Q13 If no, go to Q13</p>	<p>Q20. When do you apply wound hygiene on patients' wounds?</p> <ul style="list-style-type: none"> <li>• At the initial presentation/assessment</li> <li>• When the wound has not responded to standard of care</li> <li>• Other (please specify)</li> </ul>
<p>Q7. When you complete a routine wound assessment, do you consider whether biofilm is present?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	<p>Q12. Why do you not use an antibiofilm strategy when completing routine assessments?</p>	<p>Q21. Which of the four steps of wound hygiene do you routinely implement (you can select more than one answer)</p> <ul style="list-style-type: none"> <li>• Step 1: cleanse peri-wound area</li> <li>• Step 1: cleanse wound</li> <li>• Step 2: debride</li> <li>• Step 3: refashion</li> <li>• Step 4: dress with antibiofilm dressing</li> <li>• None of the above</li> </ul>
	<p>Q13. Have you heard of the concept of wound hygiene?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No*</li> <li>• Other (please specify)</li> </ul>	<p>Q22. If none of the above, what prevents you from implementing wound hygiene?*</p> <ul style="list-style-type: none"> <li>• Time constraint</li> <li>• Not confident to do it</li> <li>• Not competent to do it</li> <li>• Other (please specify)</li> </ul>
	<p>Q14. Where have you heard of the concept of wound hygiene?</p> <ul style="list-style-type: none"> <li>• Online or social media</li> <li>• You read about it in a JWC article</li> <li>• You read about it in a JWC consensus document</li> <li>• You watched a webinar in which it was discussed</li> <li>• A ConvaTec rep told you about it</li> <li>• You first heard about it from another practitioner</li> </ul>	
	<p>Q15. Have you implemented wound hygiene?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	
	<p>If yes, go to Q17</p>	

continued opposite



**Table 1. The survey questions (continued)**

Q23. If you debride the wound in step 2, what method of debridement do you use (you can select more than one):
<ul style="list-style-type: none"> <li>• Surgical</li> <li>• Larvae</li> <li>• Scalpel</li> <li>• Scissors</li> <li>• Forceps</li> <li>• Curette</li> <li>• Ultrasonic</li> <li>• Soft debridement pad</li> <li>• Rubbing with gauze</li> <li>• Other (please state)</li> </ul>
Q24. Following implementation of wound hygiene, have your patients' healing rates:*
<ul style="list-style-type: none"> <li>• Improved</li> <li>• Not change</li> <li>• Deteriorated</li> <li>• It is too soon to comment</li> </ul>

aggregated results to be published. Free-text responses were subject to framework analysis, to help standardise thematic analysis of qualitative data collection. A power calculation was not performed, due to the early exploratory nature of the research and the lack of data in the literature on which to base such a calculation.

## Results

### Respondent profiles

There were 1,478 respondents, of whom 1,049 (70.8%) completed the survey in full. Over half (526, 50.1%) of the respondents work in the United States and 410 (39.1%) in the United Kingdom. The remaining 113 (10.8%) were from 39 countries, territories and dependencies, of which only Australia (10, 0.95%) returned double-digits responses. Five were left blank. Details are given in Table 2.

Respondents were asked to self-identify their roles. Specialist practitioners in wound care accounted for 40.8% (597) and generalist practitioners for 26.8% (393). Those who identified as 'other' (474; 32.4%) were asked to provide further information.

Although nearly one-third of respondents identified their roles as 'other', of those who provided roles in the 'please specify' free-text box, 154 identified themselves as general nurses (terms entered included practice nurse, district nurse, RN, nurse, staff nurse, LPN, LVN) and 88 indicated they were wound nurses or had wound certification (terms entered included wound-certified RN, CWOCN, wound care nurse, wound care specialist, LPN WCC, ostomy specialist). Therefore, the split between wound care specialists and generalists in the 'other' group is more even than the initial responses indicated.

Further groups in 'other' included 40 respondents who indicated they were in specialities affiliated with wound care (e.g. vascular nursing, surgery, nutrition, tissue viability, geriatrics/gerontology, emergency care, intensive care, home care); 14 trainers/educators (clinical and academic); 10 nurse specialists/advanced practitioners; six respondents working in management;

**Table 2. Location of respondents**

Location of practice (n=1049)	n	%	Location of practice (continued)	n	%
United States	526	50.1	Netherlands	2	0.19
United Kingdom	410	39.1	Poland	2	0.19
Australia	10	0.95	Puerto Rico	2	0.19
Canada	9	0.86	South Africa	2	0.19
Spain	9	0.86	Sri Lanka	2	0.19
Italy	8	0.76	Aruba	1	0.09
Ireland	5	0.48	Bahamas	1	0.09
Left blank	5	0.48	Bulgaria	1	0.09
Portugal	5	0.48	Croatia	1	0.09
Belgium	4	0.38	Gibraltar	1	0.09
India	4	0.38	Guam	1	0.09
Singapore	4	0.38	Hong Kong	1	0.09
Cyprus	3	0.29	Indonesia	1	0.09
Japan	3	0.29	Romania	1	0.09
Malaysia	3	0.29	Serbia	1	0.09
New Zealand	3	0.29	Slovakia	1	0.09
Argentina	2	0.19	Slovenia	1	0.09
Bailiwick of Jersey (UK Channel Islands)	2	0.19	Sweden	1	0.09
Brazil	2	0.19	Ukraine	1	0.09
Czech Republic	2	0.19	United Arab Emirates	1	0.09
Bailiwick of Guernsey (UK Channel Islands)	1	0.09			
Denmark	2	0.19			
Germany	2	0.19			

respondents in healthcare support roles; four students/trainees; three researchers; and three nursing consultants.

Nearly 40% respondents (n=553, 37.5%) chose the 'community care' option as their work setting, with 317 (21.6%) choosing acute care and 595 (40.6%) choosing 'other'. However, as with the options for roles, respondents who filled in the 'please specify' free-text box provided further elucidation of settings: 129 in GP/general practice/primary care/physician office, 111 in long-term care (e.g. care home/nursing home/skilled nursing facility), 48 in ambulatory care/outpatient clinic, 30 in a wound clinic, 21 in home care, 16 in rehabilitation facilities and 15 working in a hospice.

Two-thirds of respondents (n=976, 66.6%) said they have been managing wounds for more than 8 years, with a further 17% (n=249) for 4–8 years and 10.2% (n=149) for 2–4 years.

### Wound management

The respondents reported managing across the spectrum of wound types (Fig 1), with the most common being venous leg ulcers (VLUs; 85.8%, n=1,257) and the least common being open surgical wounds (68.5%, n=1003).

Results for the number of wounds in the respondents' caseload that had not responded to treatment as expected during the previous six months are given in Fig 2. About two-thirds of respondents say this occurred in between 10% and 40% of wounds (64.4%, n=943). At the two extremes, just over one quarter (26.2%, n=383) cited this for only 0–10% of wounds and nearly 10% (9.5%, n=138) for more than 40% of the wounds.

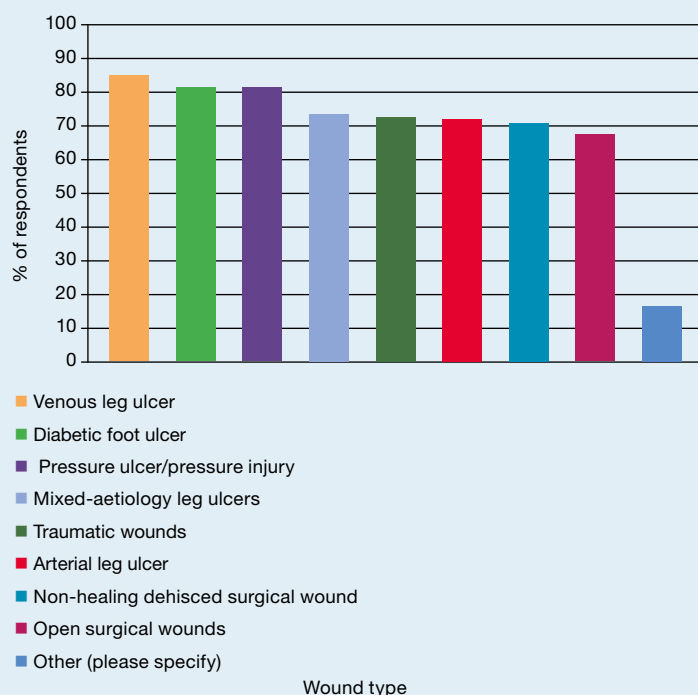
The most often-cited reason for this gap between expectation and reality was 'Patient did not comply with the management plan' (67.5%, n=984), followed by 'The presence of biofilm' (51.3%, n=750) and 'Long-standing wounds are very hard to heal' (46.2%, n=675). Full results are given in Fig 3.

### Involvement of biofilm and biofilm management

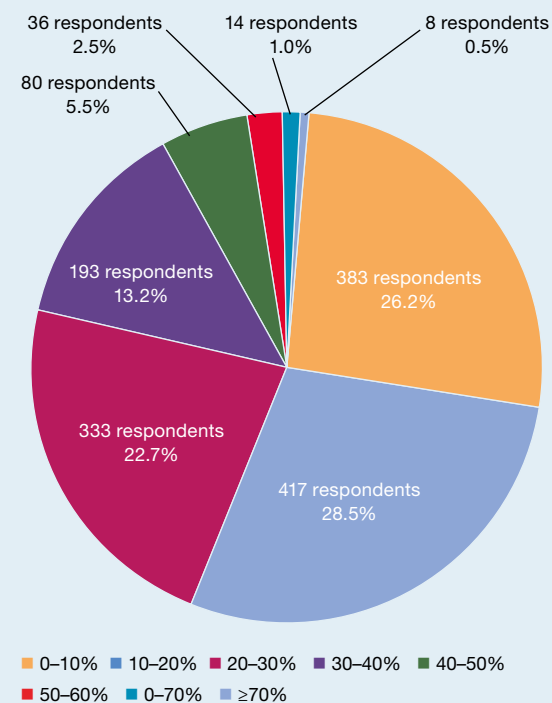
The overwhelming majority of respondents—87.8% (n=1,283)—consider whether biofilm is present when completing a routine wound assessment. The clinical indicators they most commonly look for is 'The wound surface is shiny and slimy' (77.0%, n=986), followed by 'The wound is not responding to antimicrobial dressings' (64.6%, n=828) and 'The wound is showing subtle signs of chronic inflammation' (59.3%, n=759). Full results are given in Fig 4.

In alignment with how many consider the presence

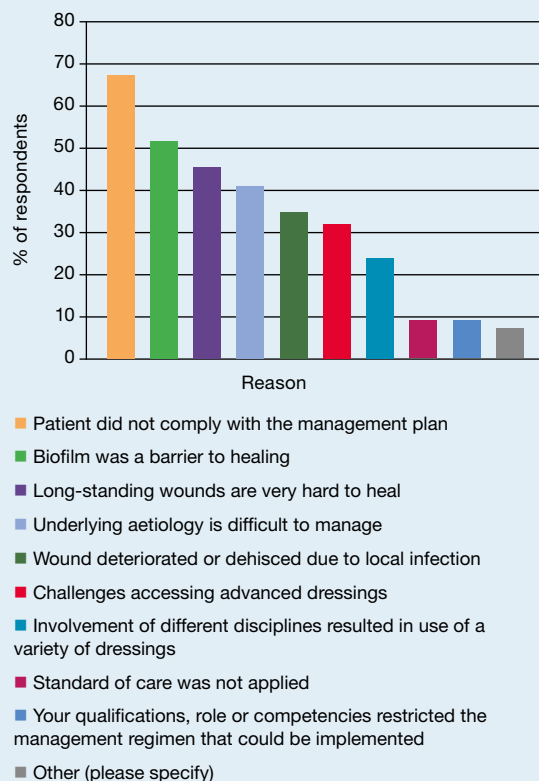
**Fig 1.** What type of wounds do you manage? (n=9168)



**Fig 2.** What percentage of wounds did not respond to treatment as expected in the past 6 months? (n=1464)



**Fig 3.** What is the main reason for the wounds not responding to treatment? (n=4758)



of biofilm, the vast majority say they use an antibiofilm strategy to manage biofilm in wounds: 70.1% (n=897), compared with 16.6% (n=213) who do not, and 13.3% (n=170) who 'don't know'. The dominant themes that arose from the free-text responses to describe the antibiofilm strategies used were a combination of wound cleansing and mechanical debridement (surgical and sharp debridement to a lesser extent), along with application of antimicrobial dressings. There was wide variance in cleansing solutions (from tap water and soap, to pH-balanced wound cleansers, to iodine and antiseptic washing solutions) and dressings (including those impregnated with silver, cadexomer iodine, honey or polyhexamethylene biguanide (PHMB); foam absorbent dressings; and hydrocolloid dressings), although the most often cited was simply 'antimicrobial dressing'.

Almost all respondents (96.1%, n=1229) believe that effective management of wound biofilm is likely to accelerate healing.

### Implementation of wound hygiene and results

More than half (57.4%, n=838) of respondents had heard of the concept of wound hygiene for overcoming the barriers to healing associated with biofilm (Box 1). Respondents who had heard of wound hygiene became aware of the concept through a variety of channels, although most (30.4%, n=259) learned about it by watching a webinar in which it was discussed (Fig 5). One in 5 (20.1%, n=171) first heard about wound

hygiene from another practitioner.

Three-quarters of respondents who have heard of wound hygiene (75.3%, n=639) have implemented it, with 63.8% of those (n=407) having done so as part of a multidisciplinary team.

Reasons selected for not implementing wound hygiene echoed the reasons for not implementing antibiofilm practices included 'You do not feel confident

### Box 1. International consensus recommendations on wound hygiene

#### General

1. Wound hygiene is a fundamental aspect of care for all patients with an open wound.
2. It should be assumed that all hard-to-heal wounds contain biofilm.
3. Non-healing should be regarded as a pathology that can be successfully addressed with the right tools, provided that the underlying aetiology is managed with gold-standard care.
4. Wounds should be triaged by level of risk, regardless of their duration.
5. Wound hygiene should be performed at every dressing change.
6. The skills, materials and time required to carry out wound hygiene make it a cost-effective approach, especially given its potential to promote faster healing.
7. Assess and manage the patient's pain expectations.
8. Even if the wound does not 'look' like it has biofilm, wound cleansing must be a priority.

#### Cleanse

9. When cleansing the periwound skin, concentrate on the area that is 10–20 cm away from the wound edges, or that is covered by the dressing, whichever is larger.
10. Use an antiseptic wash or surfactant for cleansing, if possible, and avoid cross-contamination.

#### Debride

11. Debridement is an integral part of wound hygiene; the choice of method should be based on assessment of the wound bed, periwound skin and patient tolerance.
12. Any instrument used for debridement must be sterile.
13. To avoid risk of injury, exercise caution when considering debriding lower extremity wounds in patients with poorly perfused limbs and autoimmune conditions, such as pyoderma gangrenosum.

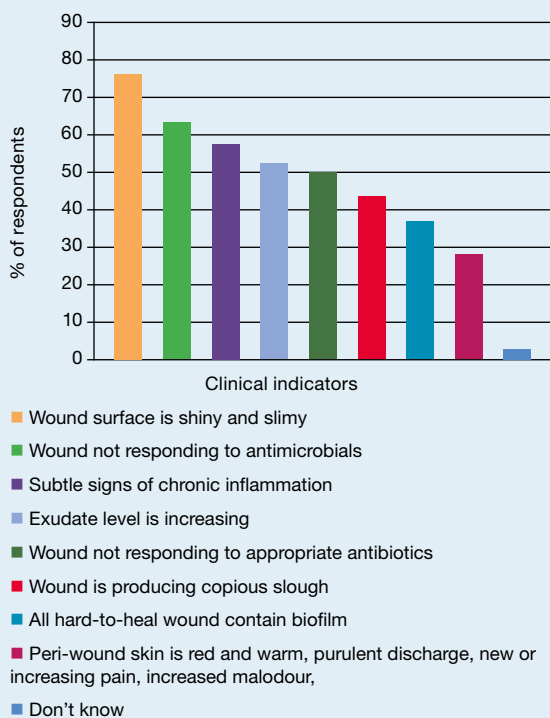
#### Refashion the wound edge

14. Wound bed fragility is rarely an issue: removing all devitalised and even some healthy tissue from the wound edges will result in regrowth of healthy tissue.
15. Any undermining, no matter how slight, needs to be addressed either by loosely packing with a dressing material or refashioning the wound edges.

#### Dress the wound

16. By disrupting and clearing biofilm, and preventing its re-formation, wound hygiene is expected to reduce the risk of infection. This could, in turn, reduce antibiotic usage in wound care.
17. Antimicrobial dressings alone are not sufficient to disrupt and remove biofilm. They should be used as an adjunct to address residual biofilm and prevent its re-formation. This can only be done if effective wound hygiene is carried out.
18. Biofilm is heterogeneous. Antimicrobial dressings are one part of a strategy for preventing biofilm re-formation. Effective suppression may require alternating antimicrobial dressings. Re-assess dressing choice and make adjustments, as needed, based on the wound's progression towards healing and local availability of dressings.

**Fig 4.** What are the clinical indicators of wound biofilm? (n=5326)



to implement wound hygiene independently without further training and supervision' (39.0%, n=82), and 'You do not feel competent to implement wound hygiene independently without further training and supervision' (24.8%, n=52). However, one-quarter (25.7% n=54) 'require more research evidence on the efficacy of wound hygiene before you will implement it'. Full results are given in Fig 6.

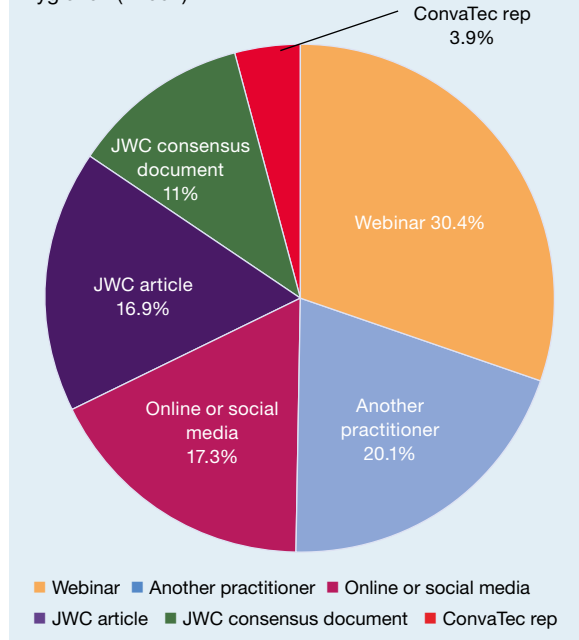
VLUs, DFUs and pressure ulcer/injury were the three wound types most-widely treated with wound hygiene. More details are given in Fig 7.

Respondents who have implemented wound hygiene are not necessarily using it all the time: 78.7% (n=503) 'always' apply the concept and 20.8% (n=133) 'sometimes' do so. Over three-quarters (75.7%, n=484) initiate it at first presentation/assessment, and 21.1% (n=135) when the wound has not responded to standard of care.

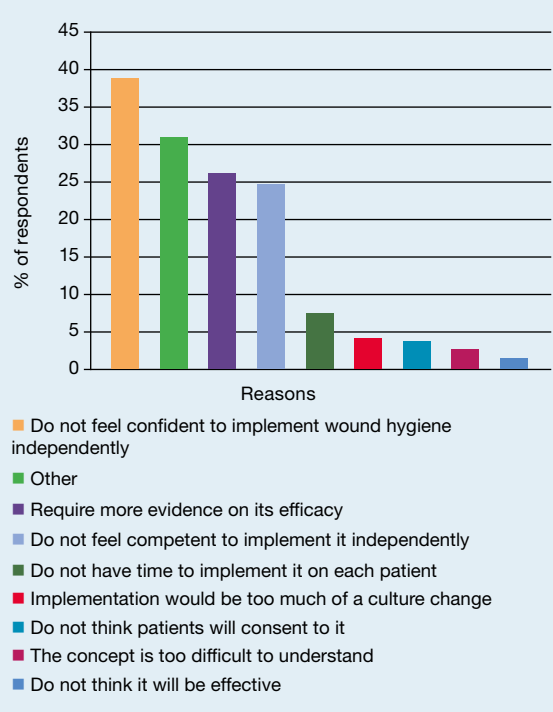
A technical error in the survey resulted in those who routinely carry out the steps of wound hygiene being presented with the question, 'If none of the above, what prevents you from implementing wound hygiene', which confounded the results. Although only 0.30% (n=2) had responded 'none of the above' to the question about the steps of wound hygiene, 622 respondents answered the question about barriers, with 30.5% (n=190) citing time constraints and 5.10% (n=32) each citing confidence and competence. Another 59.2% (n=368) ticked 'Other (please specify)', with the vast majority either leaving the fill-in box blank or noting that the question was not applicable to them.

Looking specifically at 'step 2: debridement', mechanical and sharp debridement were the most

**Fig 5.** Where did you first hear of the concept of wound hygiene? (n=851)



**Fig 6.** Reasons for not having implemented wound hygiene (n=290)



popular methods used, respectively. More detail is given in Fig 8.

Overall, following implementation of wound hygiene, 80.3% (n=513) reported that their patients' healing rates had improved. Another 13.6% (n=87) said 'it is too soon to comment', while 5.8% (n=37) said healing rates had not changed, and just 0.30% (n=2) said wound healing rates had deteriorated.

## Discussion

The survey, garnered results from a large group of HCPs (mostly nurses) involved in wound care in a variety of roles and a range of settings, demonstrate that there is much interest in wound hygiene. Respondents skewed towards long experience in wound care.

The results also revealed the spectrum of wounds that are treated in these settings, and that use of antibiofilm strategies are generally considered important by those with long-term wound-care experience.

It should be noted that the respondents were mostly wound nurses, and the bulk of care in practice is carried out by general nurses, with wound nurse visits occurring weekly or less frequently. In addition, COVID-19 may have disrupted provision of wound care services, with an increased reliance on self-care and informal care, which may have had an effect on the findings. Wound hygiene is thus likely considered, although doubtfully practised consistently in a global context at this time.

Nearly every respondent believes that effectively managing biofilm is likely to advance wound healing, representing large strides since the concept was first

introduced. Yet the numbers reporting that at least one in five wounds are not healing as expected indicate that there is a gap between expectation and healing responses in wound-care practice, with most of the reported explanations falling under the purview of the wound management plan. In addition, about one in 25 HCPs do not consider whether biofilm is present when completing a routine wound assessment, and 30% either do not use or do not know if they are using antibiofilm strategies to manage biofilm. These are not insignificant figures, and indicate there is more work to do around implementation of antibiofilm strategies.

Although the four-step wound hygiene concept is a new antibiofilm strategy, 639 respondents have begun to use it, although not necessarily on all wounds. This may be explained by the mix of wound types being treated by those who have implemented wound hygiene compared with those who have not, as different clinics will have different cohorts of patient and wound types. It may also reflect the distribution of HCPs who have responded to the survey in a non-representative sample.

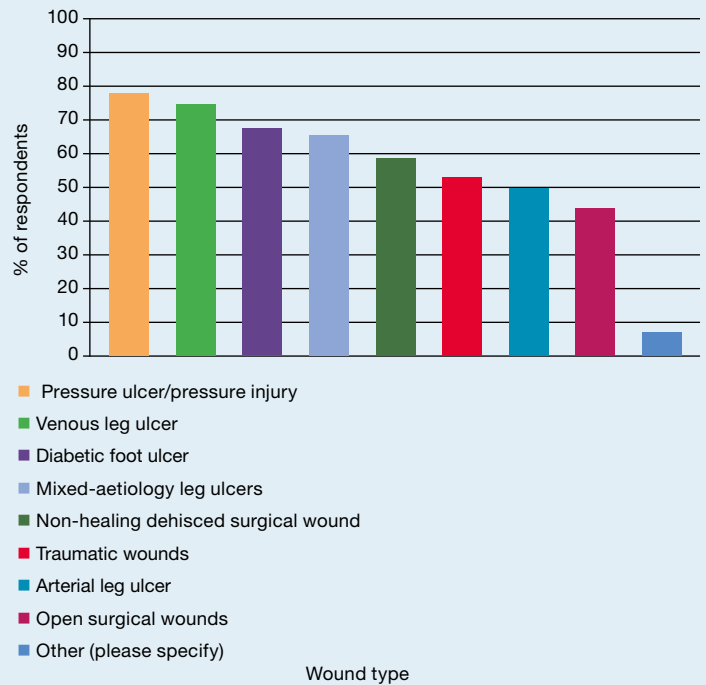
The high efficacy of wound hygiene is notable: over 80% of those who have implemented it have seen improvements in healing rates, according to the results. It is especially encouraging to see the high uptake of and variety of methods used for debridement as, historically, ‘debridement’ was often synonymous with sharp debridement. The empowering message of wound hygiene—that it can be adapted to be carried out by any HCP at every assessment—may have been adopted, as large numbers say they are using gauze or a pad for mechanical debridement, even more than are performing one of the methods of sharp debridement.

However, although wound hygiene encourages a proactive approach, the barriers to implementation of any previous antibiofilm strategy or the four steps of wound hygiene as part of routine care were similar. When asked about factors that stop them using an antibiofilm strategy, four key themes arose:

- Sixty respondents who filled in the free-text box cited lack of awareness, education, experience or confidence
- Seventeen specifically said that using antibiofilm strategies is not part of their orders, routine care or care templates/pathways
- Another 14 said that they do not think about implementing antibiofilm strategies, that biofilm is not typically present, or that they wait until they clinically judge the wound to have a biofilm. This group comprised people who are either not responsible for decision-making about managing wounds, or for whom managing wounds was not applicable to their role.

Similar themes emerged for reasons that wound hygiene might not take place. These include patient consent/patient pain levels; inconsistency of team members who manage the wound/difficulty communicating across teams/facilities; variance in practitioner skill/knowledge levels; overall facility policy/role restrictions; access to products; and where

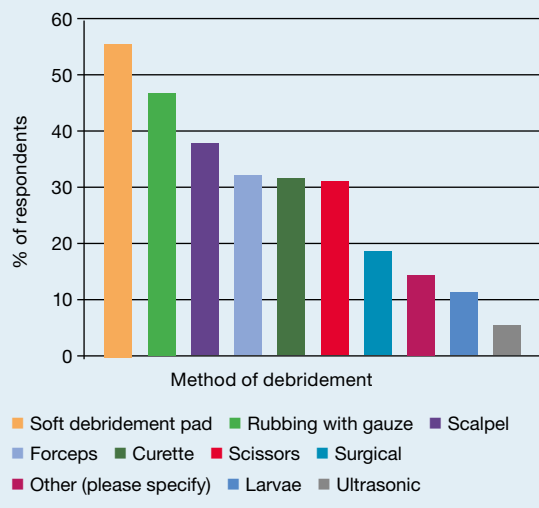
**Fig 7.** What wound types have you applied wound hygiene on? (n=3214)



it is felt that wound hygiene is not indicated for the wound.

These results indicate that educational efforts and training are required, not only for individuals who recognise a need for wound hygiene implementation, but also to overcome institutional and structural barriers. In addition, there is a need to enhance practitioner understanding of the presence of biofilm and the need to manage it, and to promote safe methods and supportive policies for doing so. With regards to

**Fig 8.** What method of debridement do you use for step 2? (n=1747)





wound hygiene, patient education tools may support uptake, while wound-specific guidelines can inform policies and outline strategies for dealing with common concerns about it. Further surveys may be undertaken to reveal priorities in relation to wound types, as well as preferences with regards to educational content on, for example, biofilm formation, the rationale for wound hygiene, effective implementation of the concept across the multidisciplinary team and the method of delivery. Provision of continuing professional education credits could also be discussed. As many respondents first heard about wound hygiene from another HCP, peer-to-peer sharing of knowledge could be a route to target for educational initiatives. In addition, respondents were interested to hear new evidence on the efficacy of wound hygiene, indicating that there is a gap in the literature on this and a need for ongoing research.

### Limitations

The survey was distributed via the JWC email distribution list with an incentive to complete, and was supported by ConvaTec, which sponsored and promoted the wound hygiene consensus document and webinar, which could have increased the numbers of participants with high awareness of wound hygiene.

The survey was in English, which may have limited responses from countries where English is not an official language. Furthermore, the lack of definitions within the survey around professional roles and types of setting may have led to the inconsistency in responses.

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Finally, a technical error meant that more participants than intended were able to see and respond to one of the questions; however, the themes of the responses to the question were useful in understanding barriers to wound hygiene and founding the basis of the discussion above.

### Conclusion

The survey showed that respondents strongly agree that implementing wound hygiene is a successful approach for biofilm management and a critical component for improving healing rates in hard-to-heal wounds. However, there are some barriers to uptake; education might be required to imbue confidence in the concept and training to support feelings of competence in carrying out the four steps. Lack of inclusion of the concept in policy and protocols, as well as limited access to certain aspects of its steps, point more broadly to a need for institutional support, quality-improvement strategies and regional policy development. Overall, there is a desire among HCPs across roles and settings for the publication and dissemination of further research on clinical outcomes achieved with wound hygiene. **JWC**

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