



SHUTTERSTOCK/OLIVER LE MOAL

ABCDEFGHI Systematic Approach to wound assessment and management

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Abstract: The ABCDEFGHI approach introduces a systematic approach to wound care. It instructs the clinician to **A**sk pertinent questions, including those that may identify local and systemic **B**arriers to wound healing. After obtaining a thorough history, the clinician may proceed to **C**lean the wound and **D**o a physical examination, specifically looking for **E**xposed structures and **F**actors that will complicate the healing process. **G**ood **H**ealing strategies involving various dressings can then be implemented to promote healing. If necessary, a referral can be made to **I**nvolve specialists using various referral pathways. Information used to synthesize this approach was obtained through a review of national and international guidelines and Google Scholar, MEDLINE, and PubMed databases. The ABCDEFGHI approach to wound assessment and management is a simple and easy-to-follow guide that can be easily implemented into practice, thereby improving clinician confidence and competence in wound care.

Keywords: assessment, barriers, healing, infection, primary care, skin, wound care

Introduction

Wounds are often managed inappropriately because clinicians lack the knowledge required to accurately assess and diagnose wounds.¹⁻⁴ Research indicates that physicians and nurses do not receive adequate wound education, perpetuating wound mismanagement.⁵⁻¹³ Wounds that are not managed appropriately may result in delayed healing, complications, decreased quality of life, and increased healthcare costs.^{3,4,14}

Thus, having an evidence-based, systematic approach to wound assessment and management is imperative to ensure accurate diagnosis, promote healing, and increase clinician competence and confidence. Although there are several wound assessment tools available, many clinicians choose not to use them or use them inconsistently.¹⁵ In addition, many of the tools do not offer clinicians a holistic assessment of the patient.^{4,14} Barriers to using wound assessment tools may also arise from a lack of consensus and ambiguous information that lacks practical directives.^{4,16}

This article outlines a systematic approach to wound assessment and management that utilizes best practices and combines elements of several wound assessment tools, providing clinicians with a holistic approach that guides them through all the necessary steps for accurate assessment and management. The ability of clinicians to accurately assess and manage wounds confers many benefits to both the patient and the healthcare system, including improved healing, documentation, and interprofessional communication, as well as decreased patient travel and healthcare costs.

The systematic approach that the authors recommend is the ABCDEFGHI approach (see *ABCDEFGHI approach to wound assessment and management*). This mnemonic outlines the basic overarching steps that members of the healthcare team should undertake for any patient encounter involving wound care. Each step is described in detail with clear and concise instructions to improve clinician competence and confidence in wound assessment and management. It is important to note that the extent to which a single clinician will carry out each of these steps is context specific. For example, in rural and underserved communities where clinicians have a wider scope of practice, a single clinician may be



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more directly involved in many of the steps contained within the process. Alternatively, in a larger center with more resources and more clearly defined roles, members of the healthcare team may only be involved in a subset of steps within the process.

Methods

Information for this wound assessment and management approach was collected from guidelines from prominent national and international organizations including Wound Care Canada, Wounds UK, Wounds International, and the World Union of Wound Healing Societies. The authors

also carried out a literature search using Google Scholar, MEDLINE, and PubMed databases to further inform the approach described in this article. Search terms included “wound,” “assessment,” and “management.” Additional resources were identified by combing through the references of each of the guidelines and articles used in this study. The authors extracted information from the guidelines and articles that related to wound history and physical examination; laboratory investigations and imaging; factors associated with poor wound healing; and management strategies including cleaning, dressing, and referring the wound. The extracted information was condensed into an original, easy-to-follow, step-by-step process.

ABCDEFGHI Approach

A: Ask

Begin the patient encounter by taking a thorough history: Accurate wound assessment requires information about the whole patient, not just the wound.^{4,14} The history should include the patient’s medical history, pain, medications, allergies, substance use, nutrition status, and psychosocial factors, including mental health status in addition to information about the wound (see *Examples of questions and their significance*).^{17–20} The Canadian Nutritional Screening Tool is a validated two-question tool that may be used to detect patients

ABCDEFGHI approach to wound assessment and management

A ASK about the wound, the patient’s medical and social history, and goals of care

B Identify **BARRIERS** to proper wound healing, including local and systemic factors

C CLEAN the wound

D DO a physical examination and order pertinent investigations

E Look for **EXPOSED** underlying structures

F Identify wound **FACTORS** that will complicate the healing process

G
H Utilize **GOOD HEALING** strategies

I INVOLVE more team members

at increased nutrition risk.²¹ Patient-centered interview techniques, such as the FIFE model (Feelings, Ideas, Functioning, Expectations), may also be used to elicit the patient's illness experience and goals with

respect to their wound and care plan.²² Together, these questions enable the clinician to accurately determine the wound etiology, note any patient factors that may pose a barrier to healing, and address any

goals of care that are deemed important by the patient.

B: Barriers

Barriers to wound healing may include both local and systemic factors.

Examples of questions and their significance

Questions	Significance
About the Wound	
When did the wound appear?	Provides information about the potential etiology of the wound, such as trauma, surgery, and extended bed rest.
How long has it been there?	Gives information about the chronicity of the wound. It is also useful to clarify if the wound has evolved.
Have you done anything about it?	Helps identify interventions that have either improved or worsened the wound.
Has anything prevented you from caring for your wound or helping it heal?	May help to identify barriers that the patient may face or a lack of available resources. Once identified, solutions may be suggested that better align with the patient's context.
Is the wound painful? How would you characterize your pain? When is the wound most painful? How would you rate your pain on a scale of 0 to 10? What have you already tried for pain relief?	Pain is important to characterize in order to offer appropriate relief. Adequate pain management will assist in maximizing patient comfort, help patients continue their activities of daily living, and increase their quality of life.
About the Patient	
What is your diet like? Can you tolerate food by mouth? How much food/fluids have you been consuming? Consider using the Canadian Nutrition Screening Tool ^a 1. Have you lost weight in the past 6 months without trying to lose this weight? 2. Have you been eating less than usual for more than a week?	Sufficient intake of both macro- and micronutrients is required for wound healing. Patients at risk for developing wounds include those who are undernourished or malnourished, have inadequate food or fluid intake, cannot feed themselves, have low body mass index, or have experienced unintended weight loss. Validated tool that identifies nutrition risk if patient responds "yes" to both questions.
What is your medical history (including mental health status and surgical history)?	Certain medical conditions, such as diabetes, or a history of surgery can point to the etiology of the wound. Others (eg, depression, anxiety, diabetes, immunocompromise) may also contribute to delayed healing or complications.
Do you have any allergies?	Allergies may be causative for certain types of wounds. Knowing drug sensitivities will also help direct the appropriate treatment.
Are you on any medications?	Certain medications may pose barriers to healing.
What is your occupation?	Some occupations may be causative or may delay healing.
Do you smoke? Do you drink alcohol? Do you use I.V. drugs?	Substance use can impair healing.
Consider using the FIFE model to ask patient-centered interview questions ²²	Using patient-centered interview questions can be incredibly helpful in assisting the clinician to understand the patient's specific needs and their goals of care, as well as ensure that the patient and clinician are working together with the patient's best interests in mind.

^a These questions are reprinted from the Canadian Nutrition Screening Tool [CNST] with permission from the Canadian Malnutrition Task Force. The CNST is available at <https://nutritioncareincanada.ca/sites/default/uploads/files/CNST.pdf> (Last accessed May 4, 2022).²¹

Factors that affect wound healing

Factor	Effect on Wound Healing
Local factors	
Foreign body	Retained foreign bodies increase the risk of infection.
Infection	Infection prolongs inflammatory processes that contribute to further tissue damage and prevent healing. If a wound is not properly decontaminated, bacterial colonies may form a biofilm. Mature biofilms are resistant to some antibiotic treatments.
Venous insufficiency	May contribute to tissue hypoxia. Increased risk of venous ulcers.
Oxygen status	Adequate oxygenation is required for cellular metabolism in the healing process. Chronic wounds are often hypoxic. Systemic factors, such as advanced age, and conditions that impair vascular flow, such as diabetes, may result in poor oxygenation.
Systemic factors	
Stressors	Stress, both psychological and disease-related, leads to immune system dysregulation and prolonged healing. Psychological stress can lead to unhealthy coping mechanisms that also act as systemic barriers to wound healing, such as alcohol use, smoking, poor sleep, poor nutrition, and sedentary lifestyle.
Age	Aging is associated with an altered inflammatory response that prolongs the healing process.
Sex hormones	In older men, androgens delay healing.
Ischemia	Ischemic disease leads to decreased oxygenation.
Diabetes	Diabetes impairs wound healing through tissue hypoxia, oxidative stress, immune dysfunction, impaired vascularization, increased protease activity, and dysfunction of fibroblasts and keratinocytes. It also increases the risk of developing chronic nonhealing diabetic foot ulcers and lower limb amputations.
Obesity	Obesity increases the risk of complications including infection, dehiscence, hematoma, seroma, pressure injuries, and venous ulcers. Wound tension and adipose tissue hypovascularity reduce oxygenation at the wound site. There is also an increased infection risk due to skin fold microorganisms and impaired immunity associated with upregulated adipokines.
Medications	<i>Glucocorticoids:</i> Systemic glucocorticoids impair wound healing through immune suppression, decreased proliferation of fibroblasts, and weakened collagen synthesis. Systemic formulations may also lead to incomplete granulation and limit contraction of wound edges. <i>Nonsteroidal anti-inflammatory drugs (NSAIDs):</i> Short-term NSAIDs may have a negative impact on wound healing, but data are limited. It is unknown whether long-term NSAID use influences wound healing. <i>Chemotherapeutic agents:</i> Impair normal healing processes and suppress the immune response, leading to delayed healing and an increased risk of infection.
Alcohol use	Prevents healing by delaying an early inflammatory response, thereby increasing infection risk and impairing cell proliferation, angiogenesis, and collagen synthesis required for new tissue growth and wound closure.
Smoking	Delayed wound healing due to reduced acute inflammatory response, vasoconstriction, and decreased skin tensile strength resulting in complications such as infection, necrosis, and poor cosmetic outcomes.
Immune status	Delay in the acute inflammatory phase or systemic immunosuppression increases risk of infection and delays healing.
Nutrition	Diets deficient in carbohydrates, protein, essential fatty acids, vitamins (particularly vitamins A, C, and E), and trace elements delay wound healing through a variety of mechanisms.

Local factors are those that are specific to the wound and surrounding tissues,²³ such as foreign bodies, infection, venous insufficiency, and oxygen status.^{23–25} Systemic factors are those that influence the patient's

ability to heal.²³ These include stressors, age, sex hormones, ischemia, diabetes, obesity, medications, substance use, immune status, and nutrition (see *Factors that affect wound healing*).^{17,18,20,23–26}

C: Clean

Before assessing the wound, it should be cleaned to clear it of infection-causing microorganisms, foreign bodies, and debris. It is recommended that the wound be flushed with

low-toxicity solutions, such as normal saline or water.^{17,18,27} Antiseptic solutions are required only when infection risk is a concern.²⁷ The appropriate use of antiseptic solutions is discussed further in the “Good Healing” section.

In some instances, wounds may require debridement as part of the cleaning process. Debridement is indicated for wounds containing nonviable tissue such as necrotic tissue, eschar, and slough.^{17,18,27} Debridement may be achieved using autolytic, enzymatic, mechanical, or surgical methods (described in the “Good Healing” section).^{17,18,27}

D: Do

Once there is clear visualization of the wound after cleaning, a physical examination may be performed (see *Recommended examination and investigation of wounds*). First, perform a visual inspection: locate the site of

the wound, note the size of the wound, and assess the wound bed, wound edge, and periwound skin.^{4,17–19,24,26,28,29} Second, feel the wound and palpate surrounding structures, such as pulses and lymph nodes, with a gloved hand.^{17,18} If applicable, joint mobility may also be examined at this point. Third, use a measurement tool to accurately record wound dimensions, including length, width, and depth.^{18,19,24,28,29}

After performing a physical examination, determine if further investigations are required. Consider obtaining wound cultures and other investigations such as blood tests, biopsies, or diagnostic imaging.^{24,25,29,30} If barriers to healing were identified, such as diabetes, obesity, and malnutrition, gather baseline measurements. With your patient, devise a plan to control these barriers and reassess the patient’s

measurements throughout the healing process to gain insight as to whether optimal control has been achieved. If the wound requires the expertise of a specialist or an allied healthcare provider, arrange a consult (see the “Involve” section). Suggested investigations are summarized later in the article.

E: Exposed

While examining the wound, note any exposed underlying structures, such as tendons, cartilage, bone, nerves, blood vessels.²⁹ If underlying structures are exposed, a referral to plastic surgery may be required for reconstruction (see *Exposed wound requiring reconstruction*). In some cases where underlying tissue is not exposed, a referral to plastic surgery may still be required for skin grafting. Wounds may require skin grafting if they cannot be adequately closed by suturing techniques.

Recommended examination and investigation of wounds

Type of Assessment	Instructions
Physical examination	
Look at the wound	Note the location and size of the wound. Observe the wound bed, wound edge, and periwound skin. Record the types of tissues present in the wound bed and their viability, as well as the amount and type of exudate, and the absence or presence of infection. Then, examine the edge of the wound and describe its appearance and moisture status. Finally, examine the periwound skin for damage, color, temperature, and hydration.
Feel the wound with a gloved hand	Feel for wound characteristics, such as slough, induration, suppleness, adherence to other structures, neurovascular status, regional lymphadenopathy, and regional palpable pulses to assess local blood supply. If applicable, examine joint mobility in the affected region.
Measure the wound’s dimensions	Measure the wound length, width, and depth. Monitor changes in measurements throughout the healing process.
Investigations	
Cultures	Obtain wound cultures to identify the specific bacteria causing infection and use this information to direct antibiotic selection. Wound cultures should be obtained with every dressing change to ensure adequate infection control. Consider obtaining blood cultures to detect systemic infection.
Blood	Obtain a complete blood count. Check hemoglobin to determine oxygenation status. Assess albumin to determine nutrition status. Examine markers of infection such as white blood cell count, C-reactive protein, and erythrocyte sedimentation rate. For patients with diabetes, glucose and hemoglobin A1C will help determine level of glycemic control.
Biopsy	Consider a wound or bone biopsy if features are suggestive of malignancy or osteomyelitis. Biopsies may also be used for culture.
Diagnostic imaging	Computed tomography scan, MRI, or bone scan may be performed if indicated. Doppler ultrasound may also be used to assess vasculature. Obtain radiologic advice for soft tissue and bone.

F: Factors

During the physical examination of the wound, make note of any factors that may complicate the healing process such as wound size or location or the presence of infection, necrosis, abnormal granulation tissue, or slough.^{4,17–19,24–26,28} Once identified, these factors must be controlled in the management plan (see *Factors that complicate wound healing*).

G, H: Good Healing

After identifying factors that may complicate the healing process, devise a management plan that controls these factors and optimizes the wound environment for healing. At this point, the wound may be categorized into one of three categories: healable, maintenance, or nonhealable.^{18,31} Depending on the categorization of the wound, various aspects of the wound and its environment must be considered when devising a management plan, such as the presence of infection or odor, moisture balance, edema, exudate, the depth of the wound, the need for debridement, and the presence of blood (see *Dressing considerations to promote good healing*).^{4,17–19,26–28,32}

Approximately two-thirds of wounds fall under the healable category, in which there is adequate blood supply for healing once the initial cause of the wound has been addressed.^{18,31} The main considerations for treatment of a healable wound include debridement of nonviable tissue, treating local inflammation or infection with topical or systemic agents, and facilitating a moist environment that promotes healing.^{18,31} Topical treatment may be used for wounds containing three or more of the following features: nonhealing, exudative, bleeding, debris (slough, necrosis), or odor.³¹ Alternatively, systemic treatment may be utilized for wounds contain-

ing three or more of the following features: large size, temperature at least 3° F higher than mirror image site, probe to or exposed bone, new or satellite areas of breakdown, increased exudate, erythema and/or edema, and odor.³¹

For wounds in which there is adequate blood supply but healing may be impeded by lack of resources or patient nonadherence, the wound is considered maintenance.^{18,31} Approximately one-quarter of wounds fit into this category.¹⁸ For maintenance wounds, any debridement carried out is conservative and minimal.^{18,31} Prevention of bacterial growth is managed by cleansing the wound with low-toxicity topical antiseptic solutions, such as povidone-iodine, chlorhexidine, and polyhexamethylene biguanide or with systemic antibiotics. Further, there is an emphasis on strategies that reduce moisture.^{18,31}

Nonhealable wounds are those in which the blood supply is inadequate and cannot be treated because

of advanced disease.^{18,31} In caring for nonhealing wounds, the goals are to maximize patient comfort, prevent worsening of the wound, and assist the patient in carrying out activities of daily living.¹⁸ In this setting, debridement is only necessary for comfort or removal of slough.^{18,31} Similar to maintenance wounds, topical antiseptic solutions and systemic antibiotics may be used to help prevent infection, and moisture reduction strategies are utilized.^{18,31}

Another good healing strategy involves correcting any modifiable risk factors that are associated with the initial wound etiology or act as barriers to healing. For example, improving patient nutrition, gaining better control of medical conditions that may contribute to wound risk, and encouraging patients to refrain from smoking or drinking alcohol may be beneficial. It is also important to help the patient manage pain to improve their quality of life during the healing process.

Exposed wound requiring reconstruction



The patient provided consent for this image to be published.

Factors that complicate wound healing

What to look for

Size

Examine the wound size (length, width, and depth) on initial presentation and every subsequent visit.

Significance

Regular measurements help monitor wound healing. Wounds that show no change in size or increase in size over time are concerning.

Example



Measurement of sacral wound

Location

Note the location of the wound.

The location of the wound may aid in identifying wound etiology, such as foot ulcers associated with diabetes. Wounds may also be located in areas that complicate healing processes such as mobile joints, wounds under pressure or in areas of high tension.



Open wound on mobile joint

Infection

Identify signs of local or systemic infection.

Local: Wounds may appear red and swollen, be hot to the touch, exhibit purulent discharge or yellow biofilm, or cause pain.

Systemic: Patient may exhibit related signs and symptoms including fever, fatigue, malaise, cardiac abnormalities, nausea, vomiting, or diarrhea.

Infection that is not treated early may complicate the wound healing process by delaying healing, causing further damage, or progressing to systemic infection.



Hand abscess with broken skin and surrounding swelling and erythema

Necrosis

Necrotic tissue is nonviable due to diminished blood supply. It may appear as eschar, which is hard, black, dry tissue. It can also appear as wet, black tissue.

Removal of necrotic tissue is required because the tissue may promote infection and delay healing. Wet necrotic tissue is suggestive of a superadded infection.



Necrotic heel with eschar

Granulation

Healthy granulation tissue is pink in color.

Abnormal granulation tissue may be red in color, loose, and poorly formed, and may bleed.

Hypergranulation is also considered abnormal.

Chronic wounds may exhibit white or yellow fibrous tissue.

Abnormal granulation tissues are associated with infection and nonhealing wounds.

White or yellow fibrous tissues in chronic wounds are avascular and will take longer to heal if not removed.



Healthy granulation tissue in leg wound

Slough

Slough is dead tissue that appears yellow or white. It can be loose or adherent.

Slough must be removed to promote growth of healthy tissue. Loose slough can be removed with bedside interventions. Adherent slough is harder to remove and may require surgical intervention.



Necrotic heel with slough

Note: All patients provided consent for their images to be published.

Dressing considerations to promote good healing

Factors to Consider	Significance	Management Strategy
Infection	Open wounds are rapidly colonized by bacteria, which increase inflammatory processes that cause further tissue damage and prevent new tissue growth from occurring. Infection control is critical to proper wound healing.	<i>Treat local infection topically</i> if redness, exudate, malodor, friable tissue, debris in tissue, or evidence of poor healing is present at the wound site. Use antimicrobial dressings, such as silver, honey, chlorhexidine, polyhexamethylene biguanide, methylene blue/gentian violet, or iodine. Acetic acid soaks daily prior to dressing application are also helpful for local <i>Pseudomonas</i> infection. <i>Treat systemically</i> if the wound increases in size or exhibits further tissue breakdown, if the wound probes bone, or if there is exudate, edema, or odor present at the wound site. Systemic antibiotics are also indicated if the patient exhibits signs of systemic infection such as fever or chills.
Moisture	Too much moisture causes maceration, whereas too little moisture causes desiccation and reduced epithelial cell migration, which will delay wound healing. Moisture balance must be restored to facilitate healing.	<i>Too much moisture:</i> use an absorbent dressing to soak up excess fluids. <i>Too little moisture:</i> add moisture by utilizing hydrogels or honey.
Edema	Edema impedes healing by impairing circulation at the wound site and may be a sign of spreading or systemic infection.	Apply compressive dressing over the edematous area.
Exudate	Exudates at the wound site may be serous, sanguineous, purulent, or a combination of these. Serous exudate is normal. Normal serous exudate supports the healing process by providing moisture and a medium that promotes diffusion of healing factors. Sanguineous exudate can be normal if associated with new vessel formation but can also be abnormal if associated with hypergranulation.	<i>No drainage:</i> use hydrocolloids, films. <i>Mild-to-moderate drainage:</i> apply hydrofibers or alginates. <i>Moderate-to-high drainage:</i> use foams, absorbent pads, or negative-pressure wound therapy.
Depth	Deep wounds are more prone to infection.	Dead space should be loosely filled with packing or negative-pressure wound therapy.
Debridement	Any black, gray, or yellow devitalized tissue, such as necrosis, slough, present at the wound site can hinder healing and promote infection. This tissue must be removed promptly to facilitate growth of healthy tissue and healing.	<i>Autolytic:</i> use hydrocolloids, films, foams, and hydrogels to help retain moisture that softens and liquifies nonviable tissue with the assistance of the body's own enzymes. <i>Enzymatic:</i> include a proteolytic agent, such as collagenase, to assist in the breakdown of devitalized tissue. <i>Mechanical:</i> use mechanical forces such as irrigation or showering to loosen and detach devitalized tissue. <i>Surgical:</i> sharp debridement performed by a trained clinician in a sterile environment.
Odor	The presence of an odor at the wound site is indicative of infection or necrosis, both of which must be controlled to promote healing.	Treat topically at the wound site using a metronidazole gel or powder. Consider use of activated charcoal dressing. If indicated, give systemic antibiotics to control infection causing odor.
Hemostasis	Some wounds, such as those associated with trauma, surgery, or cancer, may bleed. Bleeding should be controlled to limit blood loss and promote healing.	Dressings that facilitate hemostasis include nonadherent dressings; hemostatic dressings, including alginates; or pressure/bulky dressings, such as gauze.

Practice pearls

- A thorough patient history is key for identifying wound etiologies and barriers to healing that must be corrected to promote healing.
- The wound must be effectively cleaned to facilitate examination and to prevent infection and further tissue damage.
- Investigations, including serum markers, wound cultures, and imaging can identify local and systemic factors that must be managed to promote healing.
- While performing a physical examination, local wound factors that may complicate the healing process and manage these with appropriate dressings should be identified.
- When in doubt, a referral can be made to assist in the management of complex wounds.

I: Involve

Wound management sometimes requires referral to a specialist. Urgent referral may be necessary if the patient has a difficult medical history, such as having multiple comorbidities or uncontrolled diabetes mellitus, if they are experiencing sepsis, or if the wound is complex. There are two main factors to consider when deciding on a referral: wound location and wound type.

Wound location will help determine which specialist is best suited to manage the referral. For example, abdominal wounds may be referred to general surgeons; wounds to the limbs that affect bones and joints may be referred to orthopedic surgeons; wounds in which pulses are not palpable may be referred to vascular surgery; and wounds that are ulcerating, located on the hands, or related to burns or frostbite may be referred to plastic surgeons.

The wound type will help distinguish how quickly to make the referral. Any wounds exhibiting features of necrotizing soft tissue infection must be referred immediately. Any wounds that are infected and discharging or wounds that are positive for group A *Streptococcus* should be referred urgently. Wound types that are nonurgent, meaning that they can be seen within 7 days, include chronic wounds, leg ulcers, and pressure injuries. Large wounds may

be reviewed by a specialist in an ambulatory care setting.

If a nutrition risk has been identified, consulting a dietitian is critical for optimizing the patient's nutrition status. If the patient has difficulty with intake due to swallowing, a speech language pathology consultation may also be helpful.

Conclusion

This article presents a systematic ABCDEFGHI approach to wound assessment and management aimed at enhancing the basic wound care knowledge of clinicians. Following this stepwise approach will encourage the use of best practices, enhance the accurate diagnosis of wounds, and encourage the use of optimal healing strategies, thereby improving patient outcomes and clinician competence and confidence when presented with wounds. ■

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