WOUND MANAGEMENT

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Technical session IV

Wound management in animals

Speaker

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JOIN US

Venue: NVH Conference Hall
Date and time: 05/07/25 at 3:15pm

Join us for a live session!

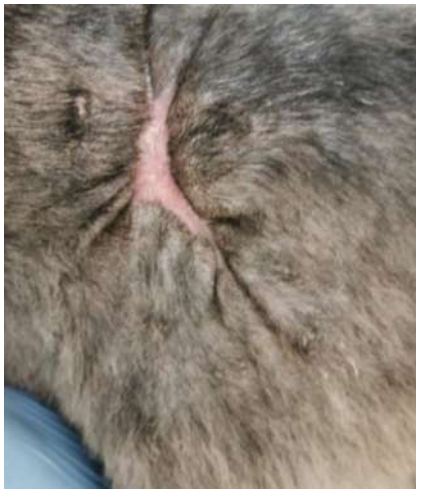
Wound?

- ✓ Why is it important?
- ✓ Types of Wound
- ✓ Why is knowing the type of wound important?

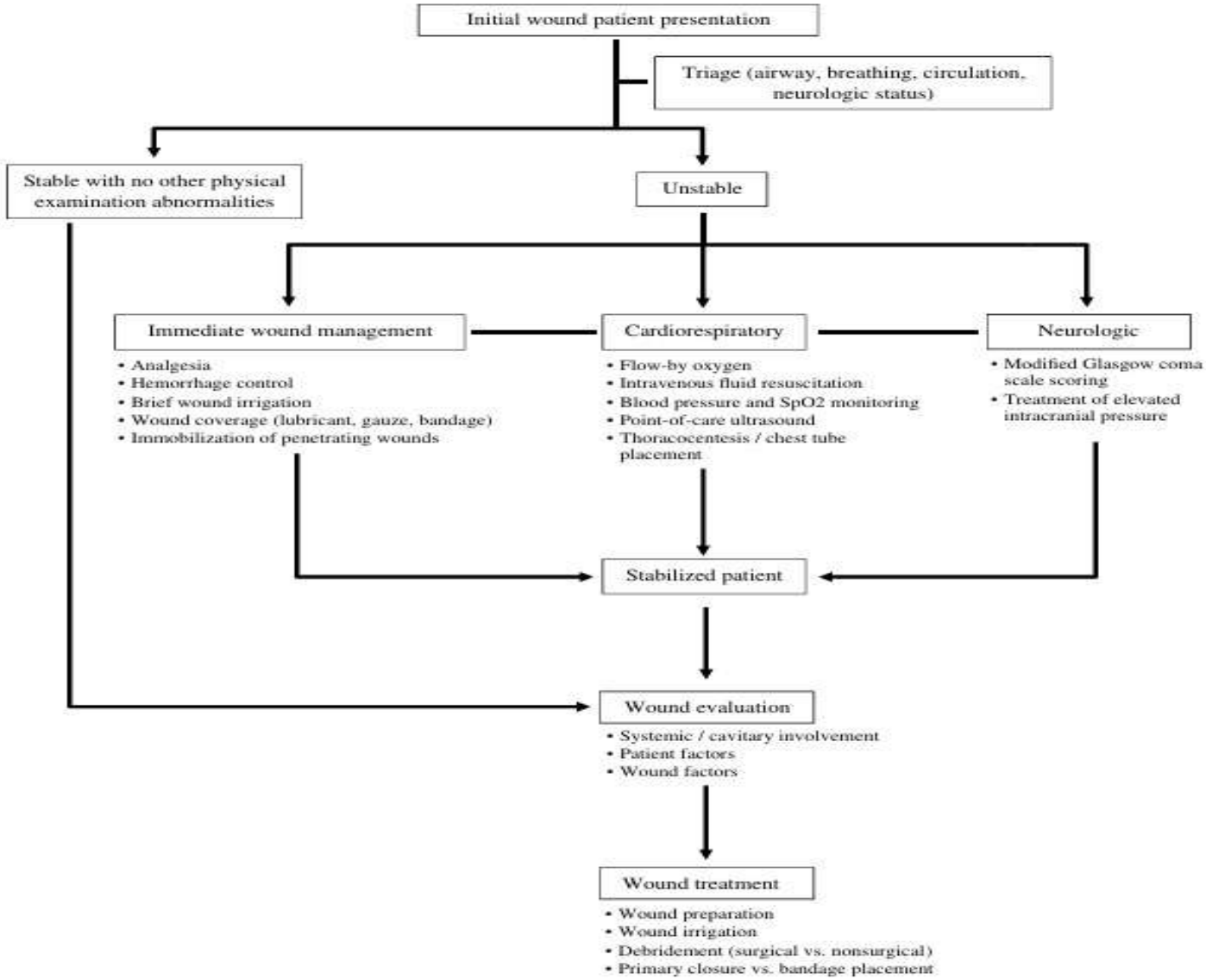
Classification Basis	Types	Description	Examples
By Cause	Incised	Clean, sharp cut with well-defined edges	Surgical incision
	Lacerated	Irregular tear with jagged edges	Dog bite, trauma from sharp object
	Abrasions	Superficial loss of epidermis/dermis	Road rash, dragging injuries
	Pressure ulcers/sores	Develop due to sustained or repetitive pressure	Paraplegic dog, prolonged recumbency
	Puncture	Deep, narrow penetration, small surface wound	Bite wound, stick/thorn penetration
	Avulsion/Degloving	Skin and/or superficial soft tissues are completely detached or torn from the underlying tissues.	RTA (road traffic accident), dog fight injuries
	Burns/Scalds	Heat/chemical/electrical damage	Hot water burns, chemical spill
By Contamination	Clean	Surgically created, aseptic, no entry into contaminated cavities	Elective spay, orthopedic surgery
	Clean-Contaminated	Surgical wound with controlled entry into GI, urogenital, or respiratory tract	Enterotomy, cystotomy
	Contaminated	Open, fresh traumatic wound (<4–6h), major break in asepsis	Fresh dog bite wound
	Dirty/Infected	Old traumatic wound (>6–8h), devitalized tissue, pus, infection present	Abscess rupture, chronic ulcer
By Depth	Superficial	Involves epidermis/dermis only	Abrasion, superficial cut
	Partial Thickness	Extends into subcutaneous tissue	Laceration, deeper abrasions
	Full Thickness	Extends through skin into muscle/fascia	Deep bite wounds, surgical incision
	Penetrating	Extends into body cavity	Bite penetrating thorax/abdomen

Stages of Wound Healing

Stage of Healing	Clinical Picture	How to Recognize / Identify	Key Interventions / Management	
Hemostasis (Immediate, minutes to hours)	Bleeding at wound site, formation of clot, initial vasoconstriction	Fresh wound with active bleeding or clot formation; no inflammation yet	- Control hemorrhage (pressure, hemostatic agents)- Protect wound from further contamination- Stabilize patient if blood loss significant	
Inflammatory / Lag Phase (0–3 days)	Red, swollen, painful wound; heat and exudate; possible fever	Wound appears erythematous, edematous, warm; exudate may be serosanguinous; patient may be systemically affected	- Clean wound (irrigation, debridement if necrotic tissue)- Control infection (topical or systemic antibiotics if indicated)- Pain management and anti-inflammatories- Prevent further contamination	

Proliferative / Repair Phase (3–14 days, may extend depending on wound)	Granulation tissue formation (pink, moist, granular appearance), angiogenesis, epithelialization, wound contraction	Progressive increase in bright red- to- pink “fleshy” cobblestone tissue within the wound; colloquial “scar,” which appears as a white, shiny, hairless covering	- Maintain moist wound environment- Protect wound (dressings)- Avoid trauma to granulation tissue- Support nutrition and hydration- Monitor for infection	 
Maturation / Remodeling Phase (Weeks to months)	Scar tissue formation, decreased vascularity, wound contraction continues; wound becomes stronger but less vascular	Best observed via wound size reduction across serial bandage changes; Wound appears pale or whitish, less raised; tensile strength gradually increases	- Continue wound protection until fully healed- Gradual reduction in dressing frequency	

LIFE BEFORE LIMB


Initial wound patient presentation
Triage (airway, breathing, circulation, neurologic status)
Stable with no other physical examination abnormalities
Unstable
Immediate wound management
• Analgesia
• Hemorrhage control
• Brief wound irrigation
• Wound coverage (lubricant, gauze, bandage)
• Immobilization of penetrating wounds
Cardiorespiratory
• Flow-by oxygen
• Intravenous fluid resuscitation
• Blood pressure and SpO2 monitoring
• Point-of-care ultrasound
• Thoracocentesis / chest tube placement
Neurologic
• Modified Glasgow coma scale scoring
• Treatment of elevated intracranial pressure
Stabilized patient
Wound evaluation
• Systemic / cavitary involvement
• Patient factors
• Wound factors
Wound treatment
• Wound preparation
• Wound irrigation
• Debridement (surgical vs. nonsurgical)
• Primary closure vs. bandage placement

Core framework of wound management

Wound Preparation

Wound Irrigation/lavage

Wound Debridement

Wound Closure

1. Wound Preparation

- You should always wear gloves
- Apply a water-based gel like KY jelly/ultrasound gel/hydrogel or saline-soaked gauze to prevent contamination of the wound
- Clippers (standard) – scissors
- Blade- skin irritation and microtrauma, increased risk of infection, delayed healing
- Use saline, diluted chlorhexidine, povidone iodine
- Use sterile gauze or sponges soaked in the chosen solution to gently clean the area around the wound.
- The skin around the wound should be prepped as if the patient is going into surgery

2. Wound Irrigation

- The type of fluid used for lavage is less important than the amount of fluid utilized.
- The amount of irrigation utilized is approximately 50 ml per centimeter of wound length in human studies, though no current veterinary studies have evaluated a standard volume.
- Ideal irrigation pressures have not been defined, though a balance between contamination removal and local tissue damage, contaminant dissemination caused by irrigation should be considered.
- Irrigation solutions-

1. Sterile saline
2. Diluted chlorhexidine(avoid detergent based) (0.05% solution; 3.5 mL of 7.5% solution in 500 ml of fluid)
3. Diluted betadine (0.1% solution; 10 mL of 5% solution in 500 ml of fluid)

3. Wound Debridement

The goal of initial wound debridement is to remove foreign contamination as well as non- viable or necrotic tissue.

1. Surgical

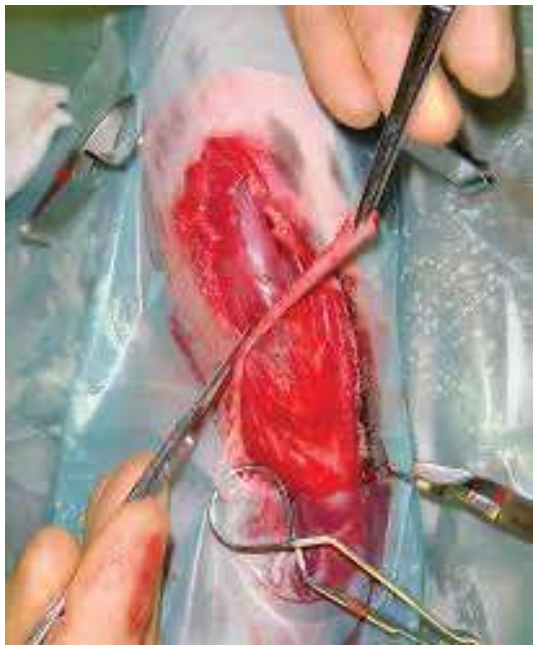
Deliberate removal of necrotic, contaminated, or non-viable tissue from a wound to promote healing, reduce infection risk, and prepare the wound for closure or granulation.

Puncture wound exploration

1. Gently grasp the edges of puncture with forceps and place hemostats/CTAs within wound.
2. Sweep the hemostats in a 360° fashion paying particular attention to any ventral or gravity-dependent pocketing.
3. Be careful NOT to force the hemostats or CTAs into tissue thereby creating a deeper wound.

1. En-bloc wound debridement

- Aseptic technique of the surrounding region must be followed.
- Following skin preparation and draping, the necrotic or unhealthy tissue will be sharply excised 2- 3 mm from the declared edge with a blade so that healthy bleeding tissue is visualized.
- If the wound is deemed ready to be closed, appropriate suture is used to close the wound in multiple layers



2. Layered wound debridement

- Gently grasp the edges of the wound with surgical blade and scrape the edges or top layer of tissue.
- STOP debriding when bleeding or healthier tissue is observed.
- Leave questionable tissue to re- evaluate at next bandage change/wound assessment.
- Place appropriate dressing over wound depending on phase of healing and patient factors

2. Non Surgical Debridement

Type	What it is	When it is used	Advantages	Disadvantages	How it is achieved
Mechanical	Physical removal of necrotic tissue and debris	Contaminated wounds, moderate necrosis, wounds needing rapid cleaning	-Inexpensive -Effective for contaminated wounds	-Non-selective (removes healthy tissue) -Painful -Can delay healing	-Wet-to-dry dressings -Irrigation -Gentle scrubbing / swabbing
Enzymatic	Application of proteolytic enzymes to digest necrotic tissue (e.g., collagenase)	Chronic wounds, moderate necrosis, when sharp surgery not possible	-Selective -Less painful than mechanical	-Expensive -Requires repeated application	-Apply enzymatic agents -Cover with moist dressing -Continue until necrotic tissue reduced
Autolytic	Uses body's natural enzymes and moisture to liquefy and remove necrotic tissue	Mild necrosis, stable wounds, not grossly infected	-Selective (only necrotic tissue removed) -Painless	-Slow process -Not suitable for infected or very exudative wounds	-Apply moisture-retentive dressings (hydrogel, hydrocolloid, occlusive foam)- Change dressing every 24–72 hrs

4. Wound Closure

Type	Definition	When Used	Advantages	Disadvantages	Examples
Primary Closure (First Intention Healing)	Immediate closure of a wound by apposing skin edges with sutures, staples, or adhesives	Clean or clean-contaminated wounds with minimal tissue loss	Rapid healing, minimal scarring, restores function quickly	Requires aseptic wound, risk of infection if contaminated	Surgical incisions, fresh lacerations sutured immediately
Delayed Primary Closure	Wound initially left open for 2–5 days for debridement & control of contamination, then surgically closed	Contaminated or high-risk wounds where infection needs control first	Allows time to assess tissue viability, reduces infection risk	Delays healing time, requires multiple procedures	Dog bite wounds closed after lavage & debridement
Secondary Closure	Surgical closure performed after granulation tissue has developed (usually >5 days)	Severely contaminated, infected, or large traumatic wounds	Better control of infection before closure	Longer healing time, larger scar formation	Road traffic accident wounds closed after infection control
Second Intention Healing	Wound left open to heal naturally by granulation, contraction, and epithelialization	Large wounds with extensive tissue loss, infected wounds, or when closure not possible	No surgery required, useful for extensive tissue loss	Prolonged healing, excessive scarring, risk of contracture and poor cosmetic outcome	Large degloving injuries, abscess cavities, chronic ulcers

Decision-Making for Wound Closure

1. **Time since injury** – Fresh wounds (<6–8 hours) favor primary closure; older wounds may require delayed or second intention.
2. **Wound contamination** – Clean vs. contaminated or infected wounds. High contamination favors delayed or second intention healing.
3. **Tissue viability** – Presence of necrotic tissue requires debridement before closure.
4. **Wound location** – Areas with high tension, movement, or poor blood supply may heal better with open wound management.
5. **Size and depth** – Large or full-thickness wounds often need delayed closure or second intention.
6. **Patient factors** – Age, systemic disease, immune status, mobility.
7. **Availability of tissue for closure** – Excessive tissue loss may require grafts, flaps, or second intention.
8. **Risk of infection** – Wounds at high risk of infection may be left open initially.

Open Wound Management

Aspect	Open Wound Management (With Dressing)	Leaving Wound Open (Without Dressing)
Infection Control	High (dressing acts as a barrier)	Low (open wound exposed to contaminants)
Healing Time	Faster (moist wound healing)	Slower (dry environment hinders healing)
Granulation Tissue	Encouraged, protected by dressings	Exposed, prone to damage
Ease of Care	Requires regular changes, more effort	Minimal intervention, easier
Protection	Is protected	Is vulnerable

Dressing and Bandaging

1. Primary/contact layer

 Topicals

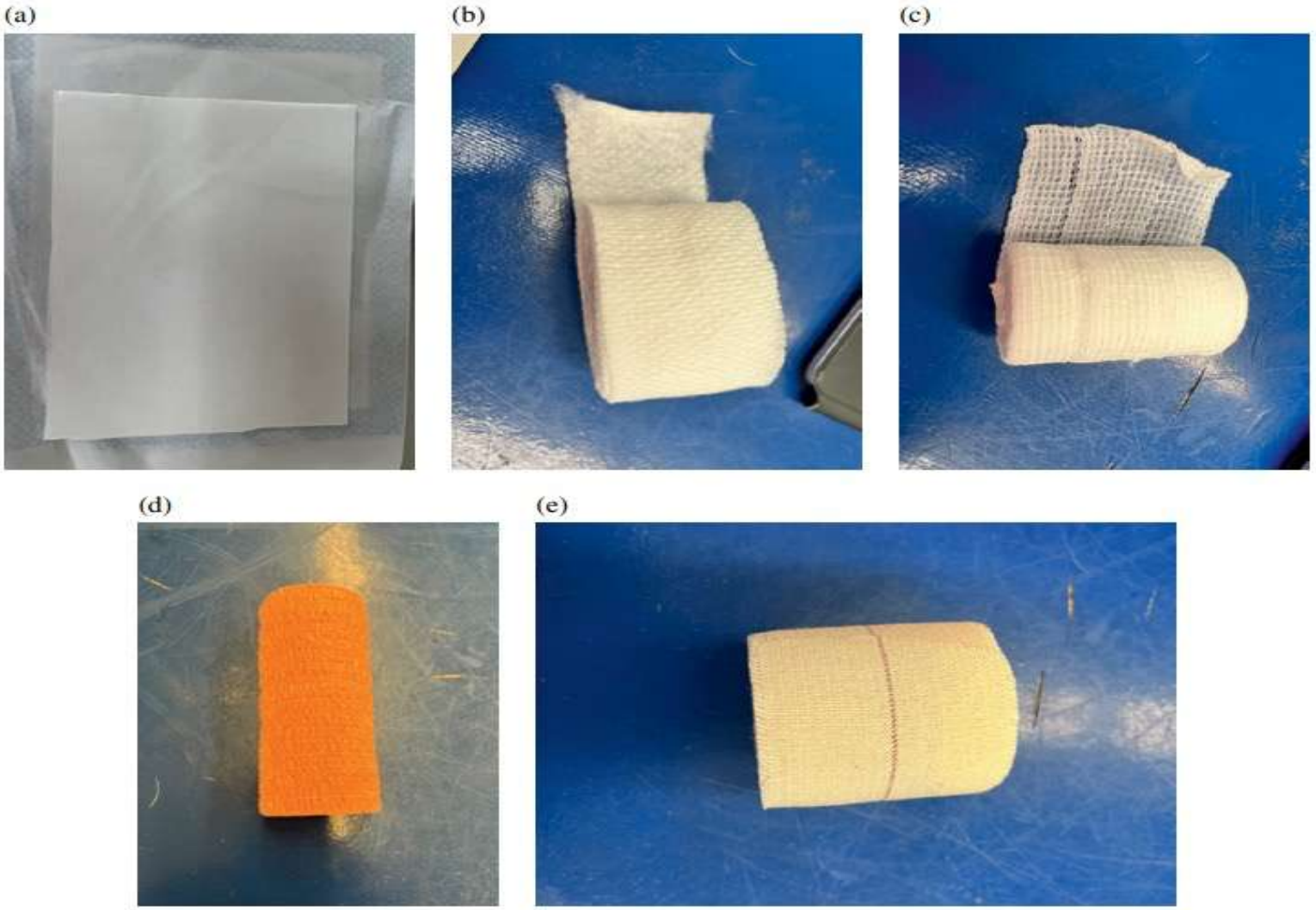
 Dressing

2. Secondary/absorbent layer

3. Tertiary/support layer

Bandaging

1. Aseptic technique is used throughout.
2. Place primary layer gently over wound
3. Apply padding/cotton roll to protect wound and absorb exudate
4. Add conforming layer (gauze roll) to hold padding in place
5. Secure outer layer with adhesive tape or cohesive bandage
6. The dressing is removed in 24 hours, or sooner if strike through is noted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Tie-over Bandage

Enables bandaging and open wound management for hard-to-bandage areas like thorax, abdomen, inguinal areas, hips.

When to Use a Tie-Over Bandage

Difficult-to-Bandage Locations: Areas like the chest, abdomen, hips, or shoulders.

Post-Surgical Wound Care: Following excisions or reconstructive surgeries.

Large or Irregular Wounds: When wrapping would compromise fit or wound access.

Areas Prone to Slippage: Where traditional bandages may not stay in place.

Procedure

Place suture loops, using monofilament, nonabsorbable suture, in healthy tissue around the periphery of the wound, approximately 2 to 4 cm from its edges. These sutures will hold the tie-over bandage material. Note: If the suture loops are too big, tension will be lost; if the loops are too tight, blood flow will be impeded.

Apply sterile bandage material to the top of the wound; wound type will determine whether this is a wet-to-dry or nonadherent bandage

Loop umbilical tape through the sutures and tie it onto itself to secure the bandage material. It is helpful to have at least 5 interrupted sutures placed in a star pattern; however, more are used for larger wounds.

Table 12.1 Home care instructions.

Keep bandage dry	• do not wash pet while bandage in place • cover bandage when walking outside
Keep bandage clean	• do not allow pet to play in dirt • do not allow pet to lick or chew bandage - USE the provided E-collar
Exercise restriction	• NO running, jumping, or rough-housing (this may cause the bandage to slip or twist/tighten) • Monitor for any slipping of the bandage
Monitor pet's behavior	• If the bandage is on a limb, pay close attention to the use of that limb. If the patient stops using the limb suddenly, bring him/her in for evaluation. • Touching the bandage gently should NOT hurt. If you notice discomfort on gentle manipulation of the bandage bring him/her in for evaluation.
Monitor for odor and fluid (strike-through)	• There should be NO foul smell coming from the bandage • There should be NO fluid soaking through the bandage
Check toes daily	• Check your pets toes daily to ensure they are not swelling or becoming bruised of painful

Moist Wound Healing

A wound care concept where the wound is kept in a moist (not wet, not dry) environment.

Included topicals and dressings that have a low moisture vapor transmission rate (MVTR), meaning low water loss and high moisture retention, on the wound surface.

The mechanisms that improve wound healing in a moist environment are multifactorial.

Moisture retentive dressing

- Hydrocolloids – form a gel with exudate, maintain moisture.
- Hydrogels – donate moisture to dry wounds.
- Foam dressings – absorb excess exudate but keep wound moist.
- Alginate dressings – absorbent bandages made from natural seaweed that form a gel upon contact with wound fluid
- Non-adherent dressings with ointments (e.g., paraffin gauze, honey-based).

Feature	Moist Wound Healing	Traditional (Dry) Bandaging
Principle	Maintains a moist wound environment to support cellular activity and natural healing.	Keeps the wound dry; often uses gauze or cotton that absorbs exudate and dries the wound.
Dressing Type	Hydrocolloids, hydrogels, foam, semi-permeable films.	Dry gauze, cotton pads, non-occlusive materials.
Wound Exudate Management	Absorbs excess fluid but maintains moisture balance; prevents desiccation.	Absorbs exudate, but may over-dry the wound and damage tissue during dressing changes.
Pain	Usually less painful; dressing changes are less traumatic due to non-adherence.	Often more painful; dressings may stick to wound bed causing trauma on removal.
Debridement	Autolytic debridement is facilitated by moisture (body's enzymes break down necrotic tissue).	Requires mechanical or surgical debridement; dry dressings do not support autolysis.
Frequency of Dressing Change	Less frequent; depends on exudate and dressing type (often 1–3 days).	Often more frequent (daily or multiple times/day) to prevent dryness or maceration.
Clinical Outcome	Faster healing, better cosmetic outcome, less scarring.	Slower healing, more pain, higher risk of scarring and delayed closure.
Best Use	Partial- to full-thickness wounds, burns, surgical wounds, chronic ulcers.	Highly exudative wounds, heavily contaminated wounds, or when moisture-retentive dressings are unavailable.

Key Takeaways

Stabilize first! Patient safety comes before wound care.

Maintain strict asepsis. Prevent infection at every step of wound handling.

Flush it well. Use copious lavage with the right solution and concentration.

Don’t leave it open. Only expose wounds in the remodeling phase.

Secure smartly. Use RJBs and tie-over for effective coverage.