ONCOLOGY • PHARMACOLOGY • SAFETY

External Beam Radiation Therapy

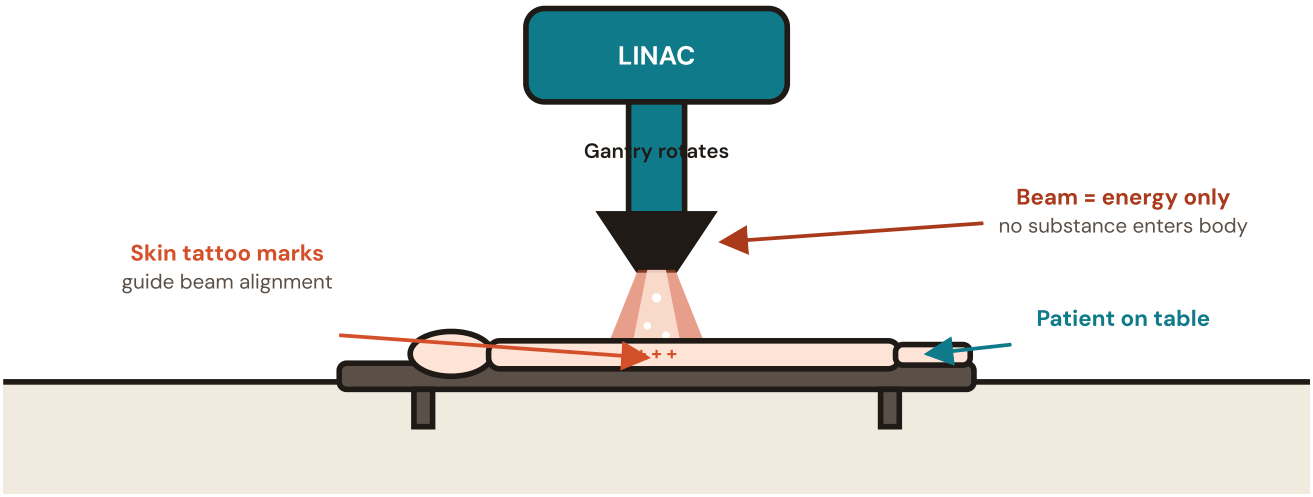
Teletherapy / X-ray Therapy: high-energy radiation delivered from outside the body to destroy cancer cells. Patient is **NOT radioactive** — no precautions needed for staff, family, or visitors at home.

★ NGN NCLEX 2026 STUDY SERIES ★

1 Definition / Overview

- **External Beam Radiation Therapy (EBRT)** = high-energy x-rays or gamma rays directed from a machine (linear accelerator) *outside* the body at a tumor. Also called **teletherapy**, **beam therapy**, or **x-ray therapy**.
- **Nothing is implanted** in the body and **no radioactive substance is given**. The radiation passes through and is gone — the patient does *not* emit radiation.
- Goal: damage DNA of rapidly dividing cancer cells so they cannot replicate. Healthy fast-dividing cells (skin, GI lining, hair follicles, bone marrow) are also affected → predictable side effects.

✓ The patient receiving EBRT is **SAFE to be around**. Pregnant nurses, children, and visitors may have unrestricted contact. The only danger is to anyone *inside the treatment room during the beam.*



Three Forms of Radiation Therapy — Quick Compare

	External Beam (THIS topic)	Sealed / Unsealed Internal
What is delivered?	Energy only (x-rays, photons, protons) from a machine	Solid implant (sealed) or IV/PO liquid radioisotope (unsealed)
Is patient radioactive?	NO — completely safe	YES — time/distance/shielding apply
Pregnant nurse may care?	YES	Sealed: NEVER. Unsealed: maybe (avoid body fluids)

Three Forms of Radiation Therapy — Quick Compare

	External Beam (THIS topic)	Sealed / Unsealed Internal
Risk to nurse	None — unless inside treatment room during beam	Direct radiation exposure / contaminated body fluids

2 ⚙️ Pathophysiology — How EBRT Works

Radiation therapy targets cells in the **S and M phases** of mitosis. Cancer cells divide rapidly → take up more radiation → die preferentially. But healthy fast-dividing cells (skin, GI mucosa, hair follicles, bone marrow) are damaged too — explaining every classic side effect.

1. **Linear accelerator (LINAC)** generates a focused beam of high-energy photons or electrons.

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2. Beam **passes through skin and tissue**, depositing energy along its path. Patient tattoos/markings ensure precise daily alignment.

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3. Energy **damages tumor DNA** (double-strand breaks). Cancer cells cannot repair → cell death at next division.

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4. Healthy **rapidly dividing cells** (skin, GI lining, marrow, hair) sustain collateral damage → predictable acute toxicity.

↓

5. Treatment **fractionated daily Mon–Fri × 5–8 weeks**. Weekend rest allows healthy cells to recover faster than cancer cells.

💡 **Why side effects are local AND systemic:** Skin and the local GI tract under the beam are damaged directly. **Fatigue, anorexia, N/V, and bone marrow depression are systemic** — caused by inflammatory cytokines and the metabolic cost of repairing tissue.

3 🔍 Signs & Symptoms / Side Effects

🟡 Early / Acute (during treatment)

- **Fatigue** — most common, cumulative
- **Skin: erythema, pruritus, dry desquamation** (peeling)
- **Anorexia, nausea, vomiting** — esp. abdominal/pelvic fields
- **Diarrhea** — abdominal/pelvic fields
- Mucositis, xerostomia, taste changes — head/neck fields
- Alopecia *only* in the treated field (not body-wide like chemo)

🔴 Late / Severe — Red Flags 🚨

- **Moist desquamation / skin sloughing** → infection risk
- **Bone marrow depression** → leukopenia, thrombocytopenia, anemia
- **Fever, signs of infection** (neutropenia)
- **Bleeding, petechiae, bruising** (low platelets)
- Pulmonary fibrosis, pericarditis, fistula formation (long-term)
- Radiation pneumonitis (chest fields), cystitis (pelvic fields)

🚨 **RED FLAG findings — call provider: temp ≥ 100.4°F (neutropenia), moist desquamation with drainage, bleeding/petechiae, severe diarrhea with dehydration, dyspnea (pneumonitis), chest pain (pericarditis).**

4 Priority Nursing Interventions

Skin Care (highest-tested)

- **Wash with plain lukewarm water only** — pat dry, never rub
- NO soap on the treatment field (unless mild, rinse-free, MD-approved)
- Apply **cornstarch** for itching
- Wear loose, soft **cotton** clothing over field
- Avoid sun, heat, ice, and tight straps over treatment area
- Use **electric razor only** — no wet shaving

Treatment Markings

- **DO NOT WASH OFF** ink lines or tattoos
- Markings ensure beam hits the exact same spot each session
- If permanent tattoos used → cannot be removed; reassure patient
- Cover markings only with provider-approved dressings

Nutrition & GI

- Small, frequent, **high-protein, high-calorie** meals
- Bland, low-fiber if diarrhea (abdominal/pelvic field)
- Antiemetics 30 min before treatment if N/V
- Mouth care q2h with saline/baking soda — **no alcohol-based mouthwash** (head/neck fields)
- Encourage fluids — 2–3 L/day unless contraindicated

Bone Marrow / Infection

- Monitor **CBC weekly** — WBC, platelets, Hgb
- Neutropenic precautions if ANC < 1000
- Avoid crowds, raw fruits/veggies, fresh flowers/plants
- Bleeding precautions if platelets < 50,000 (soft toothbrush, no IM, no aspirin)
- Energy conservation — pace activities, plan rest periods

✓ DO (skin care)

- ✓ Pat dry with soft towel
- ✓ Plain water for cleansing
- ✓ Cornstarch for pruritus
- ✓ Cotton clothing

✗ AVOID (skin care)

- ✗ Soap, lotions, perfumes, deodorants on field
- ✗ Ointments containing **metals** (zinc oxide, aluminum)
- ✗ **Talcum powder**

- ✓ Electric razor only
- ✓ Keep markings intact

- ✗ Sun exposure — even after treatment ends
- ✗ Heating pads, ice packs, hot water bottles on field
- ✗ Adhesive tape on the treatment field

5 💊 Pharmacology — Skin & Symptom Support

EBRT itself is not a medication, but supportive pharmacology is heavily tested. Most products are applied **after** treatment, not within 4 hours before, and must be **metal-free**.

Drug / Product	Use	Key Considerations
Aquaphor / hydrophilic creams (water-based, metal-free)	Skin moisturizing for dry desquamation	Apply **after** treatment, not within 4 hr before; check protocol
Cornstarch	Pruritus / mild skin irritation	Safe alternative to talc; do NOT apply to broken skin or skin folds
Silver sulfadiazine (Silvadene)	Moist desquamation (per order)	Only on broken skin per provider; **contains metal — wipe off before next treatment**
Ondansetron (Zofran)	Radiation-induced N/V	Give 30–60 min before treatment; monitor QT interval
Loperamide (Imodium)	Diarrhea (pelvic/abdominal fields)	Hold if fever or bloody stools (rule out infection first)
Saline / baking soda mouth rinse	Mucositis prevention & care	q2h while awake; **NO alcohol-based** mouthwash
Filgrastim (Neupogen)	Severe neutropenia from marrow suppression	Bone pain is the #1 side effect; teach pre-medicate with acetaminophen
AVOID: zinc oxide, aluminum-based deodorants, talc, alcohol-based products	**Metals scatter the radiation beam and worsen skin reactions. Alcohol dries skin further.**	

6 ⚠ NCLEX Test Traps

The NCLEX loves to test whether you confuse **external** with **internal/sealed** radiation. Read the stem carefully — the precautions are completely different.

The Trap	Wrong Answer	Right Answer
"Time, distance, shielding" applies to…	External beam patients	Sealed internal (implant) patients only — EBRT patients are NOT radioactive
Pregnant nurse caring for EBRT patient	Not allowed	Allowed — patient does not emit radiation
Patient asks: "Can my grandchildren visit?"	"No, you are radioactive"	"Yes, you are not radioactive between treatments"
Skin cleaning during treatment course	Soap and water with vigorous scrubbing	Plain water only, pat dry, do NOT wash off ink markings
Itchy skin in the field	Apply talcum powder	Apply **cornstarch** (no metals, no talc)
Best moisturizer choice	Zinc oxide ointment	Water-based, metal-free cream (e.g., Aquaphor) applied AFTER treatment
Hair loss with EBRT	Total body alopecia	Only in the treated field (e.g., scalp if brain field)
Patient hot/cold over treatment site	Apply heating pad or ice pack for comfort	Avoid all temperature extremes — increases tissue damage
Priority assessment before each session	Anxiety level	Skin integrity + CBC trend (infection/bleeding risk)

7 🗣️ Patient & Family Education

🏠 Home / Daily Life

- "You are **not radioactive** — hug your kids, sleep next to your spouse, hold the baby."
- Treatment is daily Mon–Fri, weekends off, for several weeks
- Plan rest periods — fatigue peaks in weeks 3–5 and may last weeks after
- Treated skin will stay sensitive to sun for **at least 1 year**; wear SPF 30+ and protective clothing for life over the field

🛁 Skin & Marking Care

- Do NOT wash off the marker lines or tattoo dots
- Cleanse with plain warm water; pat — never rub
- Avoid soap, lotion, perfume, deodorant, powder on the field
- Use the electric razor only (no wet shaving in field)
- Wear loose cotton over treated skin

🍴 Eating & Energy

- Eat small, high-protein, high-calorie meals; sip nutritional supplements
- Bland foods + extra fluids if diarrhea; track stools per day
- Soft, cool foods help mouth/throat soreness; avoid spicy, acidic, alcohol
- Take antiemetic/anti-diarrheal as prescribed before symptoms peak

📞 When to Call the Provider

- Temp ≥ 100.4°F (38°C)
- Unexpected bleeding, bruising, or petechiae
- Skin breakdown with drainage or odor
- Severe diarrhea (>6 stools/day) or signs of dehydration
- New shortness of breath, productive cough, or chest pain
- Inability to eat or drink for >24 hours

8 🧠 Memory Boosters & Mnemonics

🌟 "BEAM" — Remember EBRT Truths

B • E • A • M

Body is NOT radioactive

Erythema, fatigue, GI upset are local + systemic

Avoid metals (zinc, aluminum, talc)

Markings stay on — wash with water only

🛡️ "SAFE Skin" — Daily Care Rules

S • A • F • E

Soap-free, water only; pat dry

Avoid sun, heat, ice, tape, tight clothing

Fluffy cotton, electric razor, cornstarch for itch

Examine skin daily for breakdown

🚫 "Things on the AVOID Shelf"

- 🧴 Lotions with **metals** (zinc oxide, aluminum)
- 🧂 **Talcum** powder
- 🧼 Perfumed soaps & deodorants
- 🍷 Alcohol-based mouthwash & aftershave
- ☀️ Direct sun, heating pads, ice packs
- 🩹 Adhesive tape on the field

💡 Quick Pattern Recognition

External = "Eternal" safety — patient is never hot

Sealed = "Stay back!" — time/distance/shielding

Unsealed = "Urine alert!" — gloves for body fluids

Cornstarch over Talcum — Corn = OK, Talc = TRASH

Pat, don't rub — and never erase the marker

9 🧩 NCJMM Clinical Judgment Scenario

Scenario: *A 58-year-old client receiving external beam radiation therapy to the right chest wall for breast cancer arrives for week 4 of treatment. The nurse notes erythema with patches of moist desquamation along the lateral right breast, complaints of fatigue requiring midday rest, and a temperature of 100.6°F. Today's CBC: WBC 2.8 K/µL, ANC 980, platelets 138 K/µL. The client states she has been using "a thick zinc cream" the past 3 days for itching and washed off the blue ink because "it looked dirty."*

1 RECOGNIZE CUES

Temp 100.6°F • ANC 980 (neutropenic) • moist desquamation • zinc-based product on field • alignment markings washed off • cumulative fatigue at week 4.

2 ANALYZE CUES

Fever + neutropenia = **neutropenic fever (oncologic emergency)**. Moist desquamation + open skin = portal for infection. Zinc cream contains **metal** — scatters the beam and worsens skin reaction. Lost markings compromise treatment accuracy. Multiple safety risks coinciding.

3 PRIORITIZE HYPOTHESES

#1 Neutropenic fever / infection (life-threatening) → **#2 Skin breakdown** (entry route) → **#3 Treatment misalignment** from lost markings → **#4 Knowledge deficit** regarding skin care.

4 GENERATE SOLUTIONS

Notify provider/oncologist of fever + ANC. Hold today's treatment, anticipate **blood cultures × 2, urinalysis, chest x-ray, and broad-spectrum antibiotics within 1 hour**. Initiate neutropenic precautions. Gently remove zinc cream with mineral oil or per protocol. Consult radiation oncology to **re-mark** the field. Reinforce skin and marking education.

5 TAKE ACTION

Place client in private room with neutropenic precautions. Draw blood cultures BEFORE first antibiotic dose. Administer prescribed broad-spectrum IV antibiotics within 60 minutes. Cover desquamation with provider-approved non-adherent dressing. Document fever, skin findings, and education. Schedule re-simulation/re-mark visit.

6

EVALUATE OUTCOMES

Within 24 hours: temperature trending down, blood cultures pending/negative, no new infection signs, ANC trending up. Skin: no spreading erythema or purulent drainage, healing of moist areas. New markings in place; client verbalizes correct skin care: *"plain water, pat dry, no metals, no talc, keep marks on."* Treatment resumed safely.

★ Diane's NGN NCLEX 2026 Study Series ★

External Beam Radiation Therapy • High-Yield Visual Reference

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