RICE Revisited
(Rest, Ice, Compression, and Elevation)

BOC Approved EBP Session

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Why RICE Was Chosen as a Topic?

• Standard acute injury management protocol that has been taught for **MANY** years
• Most AT’s, ATS, physicians, athletes, parents, coaches, allied health care professionals, news media & blogs, textbooks, etc advocate its use
  – Either in-part or in its entirety
• The findings of this topic would (likely) be extremely applicable in the clinical setting
  – Either you keep doing it, stop doing it, or make an adjustment to your clinical care
• Your clinical expertise on this topic is vast and can be utilized during this presentation
Specific BOC RD6 Topics

- Applying appropriate immediate and emergency care procedures to prevent the exacerbation of health-related conditions to reduce the risk factors for morbidity and mortality
  – Domain 3 (Task 2)
- Administer therapeutic modalities using appropriate techniques and procedures based on the individual’s phase of recovery to restore functioning
  – Domain 4 (Task 2)
- Administer treatment for injury, illness, and/or health-related conditions using appropriate methods to facilitate injury protection, recovery, and/or optimal functioning for individual(s)
  – Domain 4 (Task 4)
Evidence Based Medicine “Triad”

- Individual Clinical Expertise
- Best External Evidence
- Patient Values & Expectations
History of RICE

• Term “coined” Dr. Gabe Mirkin in 1978
  – *The Sportsmedicine Book*

• Recommended as an initial (first aid) treatment

• Traditionally thought of using an elastic wrap to secure an ice bag on a patient after s/he has raised the injured limb above their heart
What to Do First

The immediate treatment for almost all athletic injuries is the same, whether you’ve pulled a muscle, strained a ligament, hurt a joint, or broken a bone. It’s a four-part program that you can follow even if you will be seeking a physician’s advice and it is abbreviated RICE:

Rest: Rest is necessary because continued exercise or other activity could extend the injury. Stop using the injured part the minute it is hurt.

Ice: Ice decreases the bleeding from injured blood vessels because it causes them to contract. The more blood that collects in a wound, the longer it takes to heal.

Compression: Compression limits swelling which, if uncontrolled, could retard healing. Following trauma, blood and fluid from the surrounding tissues leak into the damaged area and distend the tissue. Swelling is sometimes useful since it brings antibodies to kill germs, but if the skin is not broken, antibodies are unnecessary and swelling only prolongs healing.

Elevation: Elevation of the injured part to above the level of the heart uses the force of gravity to help drain excess fluid.

Because swelling usually starts within seconds of an injury, start RICE as soon as possible. First place a towel over the injured area. Then apply an ice pack, ice chips, or cubes over the towel. Do not apply the ice directly to the skin as it can cause the skin to hurt.

For compression, wrap an elastic bandage firmly over the ice, around the injured part. Be careful not to wrap the area so tightly that you shut off the blood supply. The signs of a shut-off blood supply are numbness, cramping, and pain. If any of these happens, unwrap the area immediately. Otherwise, leave the ice pack and bandage in place for thirty minutes. Next, to allow the skin to rewarm and the blood to recirculate, unwrap the area for fifteen minutes. Then rewrap the area. Repeat this procedure for three hours. If the area continues to swell or the pain increases, check immediately with a physician if you have not already done so.

If the injury is severe, you can follow the RICE program for up to twenty-four hours. If pain and swelling persist forty-eight hours after the injury, apply heat. Further treatment depends on the type of tissue that was injured.
Additional RICE History

• Athletic trainers have been advocating and utilizing a basic RICE-type acute injury care protocol since at least the 1940’s
• Although not termed “RICE”
• Basic components are present
THE KNEE JOINT

Its Athletic Injuries and Their Treatment

We present the knee and its athletic injuries early in the Manual because it has become the greatest hazard of football. Hundreds of troublesome "trick" knees are the result of clipping, turning, and twisting.

Because of improper care, or playing too soon after the injury, many athletes carry knee injuries throughout life. Because a player can walk or run is no reason for putting him back in the game to be subjected to further injury.

It would be hard to imagine a knee injury without a complication of several irritating conditions. If the athlete was clipped on the outside of the knee, the Internal Lateral Ligaments might be stretched. With this stretching it would be possible to have a severing of blood vessels and nerves, thus causing an internal hemorrhage. There would probably be a slight stretching of the Cruciate Ligaments and a break in the Capsule causing swelling as the tissue fluid and blood flow into the fatty tissues and out under the skin.

Study the Large Figures
17 to 23 Inclusive

The knee joints presented in figures 17 to 23 inclusive are near actual size compared with those of the average high school athlete. They are purposely shown large to give you an idea of the relative size and position of the different ligaments, tendons and cartilages. Please study them carefully!

Particular study should be made of Figure 23. It illustrates graphically but theoretically what happens in a large majority of your knee injuries.

Along with this, visualize what may be happening in the surrounding tendons, ligaments, muscles, blood vessels and lymphatics.

(First Treatment)
The first treatment of such an injury should be the application of an Ace or Tensor bandage. Over this apply cold towels or ice packs.

The pressure of the elastic bandage would check the seepage from Capsule and Bursa. The ice would reduce bleeding. Both would help keep down the swelling and reduce the pain.

The ice treatment should be used for from 2 to 4 hours, depending on the severity of the sprain. Some universities use ice for 24 hours. After the first 8 hours, the cold treatment is gradually reduced and at the end of the treatment, heat is started very slowly and temperature gradually raised to normal.

Procedure
1. Make the patient comfortable on the training table or bed.
2. Raise the knee slightly—three or four inches. (It will probably be in a somewhat cramped position at best).
3. Apply Ace or Tensor bandage—snugly.
4. Apply ice packs.
5. Ice packs must be watched. The cold should not chill the patient.
6. Cover patient—raise his head—give him something to read. Comfort is necessary for relaxation. Water and food may be given after he recovers from the immediate shock.

It may be advisable that this cold pack be left on for a longer period. The hemorrhage should be checked within two hours but checking the seepage of fluid from the Capsule and Bursa may take much longer. This may be the reason why such treatments have not been entirely successful in the past.

7. Take off the ice pack and elastic bandage and dry carefully. Apply a heavy coating of Analgesic Balm and wrap the entire knee with a layer of cotton. Over this, put a dry Ace or Tensor bandage. Let the cotton extend an inch beyond the elastic bandage so there will be no danger of cutting off circulation of blood.
TREATMENT

The first treatment for all ankle sprains is identical. First, apply a pressure bandage. (Ace, tensor, or similar make). Make this first application snug. Then immerse in cool water or apply ice packs, cold towels or whatever you have handy. Feed this cold to the patient slowly. Don’t chill him! Don’t cause extra discomfort! If he says it is too cold, remove the cold application, and let him replace it when the pain returns.

The entire purpose of this first treatment is to stop internal hemorrhage and it is not necessary to make it so cold that pain is actually increased. Remember—it is better to take more time with this cold application than to add to the discomfort of the athlete.

This cold application should last from 40 to 60 minutes. The time must be determined by the severity of the injury and by the degree of cold application used.

Don’t forget the pressure bandage. It should be applied snugly, and it may be necessary to loosen it slightly after 10 or 15 minutes. Billy Fallon, U. S. Navy trainer, applies one piece of two inch tape in place of the pressure bandage, using it across the area where the greatest swelling occurs.

(Note to high school coaches: Where we have suggested the pressure bandage for “first treatment,” it is suggested that in order to cut the expense, you prepare and have on hand a piece of rubber inner tubing about two inches wide and thirty inches long. This can be used during the cold application only and should not be used over the Analgesic pack).

After you are satisfied that the internal hemorrhage has been stopped, dry the foot carefully and apply a light Analgesic pack. The Analgesic should be about as thick as a thin dime. The purpose is to stimulate a little surface circulation without in any way stimulating deep circulation within the injury.

The athlete is then ready for an X-ray and should be taken to the team physician.

If there is a fracture, the balance of the treatment is in the hands of the physician. If there is no fracture, take the boy home and put him to bed with his foot raised several inches—leaving the pack on overnight.

We consider the X-ray absolutely necessary to insure a successful treatment. We personally will not treat an ankle sprain beyond the original treatment unless the physician gives us the green flag.

Assuming that the X-ray has been taken and no bones are broken you are now free to go to work to assist in the rebuilding process.

On this second morning, start with a thorough examination of the injury. Discuss just how it happened. Locate pain and swelling. Massage the hip, leg and shin—to take out the cramp—and remember to make this a part of the daily treatment until cure is complete.

Use warm water—get the foot warm but not hot—massage around the toes carefully—let this delicate treatment last for one-half hour. Follow this with an Analgesic pack. Give the boy a crust or cane—depending on the severity of the sprain. Renew the Analgesic pack before bed time but be sure it is not applied too snugly.

Advise the boy to keep the foot up when sitting down and while in bed.

Starting the third morning, warm it up thoroughly and start “friction massage,” using no manipulation or twisting.

From there on gradually increase pressure and use very light manipulation. Keep up a constant low temperature heat. Don’t let the foot cool off.

Have him start walking on it while it is warm.

Remember the best you can expect.
Cramer First Aider (March 1960)

- Thank you to Matt Weber at Athletic Training History
  - www.athletictraininghistory.com
- No financial interest or conflicts
Rest Separated From RICE

- Prevents further damaging the area (relative rest vs. absolute rest)
  - Stopping activity, crutches, casts, walking boots, etc
- Excessive rest (or unnecessary pain) causing future treatment/therapy issues
  - ROM, conditioning, strength, balance, psychological issues
- Activity (during or after ice application) can increase tissue temperature
- General conclusions on rest
  - Think of “rest” more as “avoiding unnecessary pain to optimize tissue healing”
  - Most types of activity rapidly re-warm the tissue after and during ice application
Ice (Cryotherapy) Separated From RICE

• Physiological effects
  – Decreased tissue temperature (surface, IA, and IM), (local) blood flow, pain, cellular metabolism, and secondary hypoxic/enzymatic injury

• Complicating factors
  – Varying types of application techniques, tissue/adipose thickness, treatment times, activity, patient access to cryotherapy sources, patient compliance, etc

• General conclusions on ice
  – Reduces surface, IA, and IM temperatures, (local) blood flow, and pain
  – No agreement on the “ideal” rate and magnitude of tissue cooling
(External Circumferential)

**Compression Separated From RICE**

- Decreases pressure gradients between blood vessels and tissue
  - Decreases fluid accumulation
- Increases the effectiveness of ice bag application
  - Decreases space between the ice bag and skin and provides an insulation effect (elastic wraps)
- Complicating factors
  - Unknown optimal external compression pressure, “critical” application time between injury and compression application, and various types of compression (intermittent vs. continuous)
- General conclusions on compression
  - Can assist in a reduction of local blood flow, edema formation, and tissue temperatures
  - No “ideal” type, application time, or compression force has been identified
Elevation Separated From RICE

- Thought to reduce tissue volume (swelling) post-injury
- 60° vs. 20° vs. 0° of ankle elevation on volume

- Elevation (combined with compression) treatments decrease tissue volumes
  - The effects are reversed after 5 minutes of gravity
  - Compression and elevation just removes fluid; the debris remains

- General conclusions on elevation
  - Elevation does reduce limb fluid volume
  - Effects are short-lived once gravity is applied
  - Least studied separate component of RICE
Separate Components of RICE

Initial Conclusions

• Each component of RICE has specific benefits and drawbacks when examined independently

• Rest
  – Generally decreases unnecessary pain and prevents additional damage
  – Tissues quickly re-warm after minimal activity following cryotherapy application

• Ice
  – Decreases surface, IA, and IM temperatures and pain
  – Many types of cryotherapy applications exist
  – No “ideal” application technique, time, or target temperature has been determined

• Compression
  – Can assist in the prevention and removal of fluid
  – Can improve the cooling effects of an ice bag application
  – No “ideal” compression technique has been determined
    • Standard elastic wrap may not be the best option after the initial application

• Elevation
  – Decrease limb fluid volume; effects quickly reverse once gravity is re-established
  – Least studied separate component

• Does the combination of the four components provide additional benefits and improve efficiency of the whole?
Primary Clinical Question Asked...

- Patient – Athletes with acute injury
- Intervention – RICE (rest, ice, compression, and elevation)
- Comparison – Treatments other than RICE
- Outcome – Return to participation (primary); pain, edema, range of motion, strength (secondary)
Identification of an “Injury Window”
Updated Secondary Injury Information

• Decreased metabolic enzyme activity
  – Began 15 to 30 minutes post-injury
  – Continued for 5 hours (32% reduction)
  – Interventions should begin within 15 minutes post-injury

• Immediate application of intermittent cryotherapy with compression significantly reduced both muscle weight (volume) and injury size compared to compression only and no treatment
  – 30 minutes of ice applied every 2 hours; 3 total ice applications

• No difference in injury size between compression only and no treatment
  – Reduced muscle volume; no reduction on injury size
Cryotherapy and RICE-Type Treatment
Return-to-Activity Review Articles

• Ice and compression vs. no ice
  – Single application as effective as no application
  – No added benefits of continuous application vs. no application post-surgery

• Ice and compression vs. compression
  – Little evidence supports the combination of ice and compression
  – Mostly post-surgical data

• Immediate cryotherapy application after injury maybe effective

• Focal compression may result in a 25% quicker return (ankle sprains)

• Severe ankle sprains may return to activity faster with cryotherapy
  – 7.3 days vs. 10.2 days
Cryotherapy and RICE-Type Treatment
Return-to-Activity Review Articles

- “Paucity of evidence for such a well-accepted practice (ice) and the evidence available is based on small patient numbers and some inherently weak trials”
- May have a possible benefit if instituted soon after injury
- Cryotherapy is no more effective than control interventions (no cryotherapy) for improving function after acute lateral ankle sprains
- Little evidence suggested cryotherapy assisted with return to activity and improved clinical outcomes following injury
  - Generally a (weak) positive trend; with low article quality
  - No article can be identified that just evaluates “cryotherapy”
Australian Physiotherapy Association
Evidence-Based Clinical Statement

• Management of ankle sprains
  – Ice
    • Recommendations under certain circumstances (both positive and negative effects reported, limited evidence, poor research quality)
  – Compression
    • Not recommended (no evidence of a treatment effect)

• RICE
  – Rest: no direct studies; functional immobilization better than cast
  – Ice: Bleakley, et al 2004 article cited
  – Compression: Elastic bandages less effective than functional treatment with lace-up or semi-rigid braces
    • Faster return to work with brace vs. elastic bandage
  – Elevation: nothing specifically mentioned

• RICE and laser
  – Statistically significant reduction in edema volume vs. RICE only and RICE with placebo laser
NATA Position Statement
Conservative Management and Prevention of Ankle Sprains in Athletics (2013)

• Treatment and rehabilitation recommendations
  – Cryotherapy should be applied to acute ankle sprains to reduce pain, minimize swelling formation, and decrease secondary injury (Level C evidence)
  – Compression should be applied to acute ankle sprains to minimize swelling (Level C evidence)
  – The limb with the acute ankle sprain should be elevated to minimize swelling (Level C evidence)

• Level C evidence?
  – Recommendation based on consensus, usual practice, opinion, disease-oriented evidence, or case series for studies of diagnosis, treatment, prevention, or screening
Economic Impact Analysis of Ankle Sprains

- 200 workman compensation cases over a 2-years retrospectively reviewed
- Patients prescribed adjunct therapy (118 patients)
  - Missed 37 days of work on average
  - Mean average total cost of 3140.14 Euros ($3500)
- Patients without any adjunct therapy (82 patients)
  - Missed 15 days of work on average
  - Mean average total cost of 1077.86 Euros ($1200)
- Receiving physical therapy resulted in longer absence of work
  - Higher medical and workman compensation costs
- From an economical viewpoint (ability to return to work), RICE at diagnosis allowed earlier weight bearing with the fastest resumption of activities with the least associated costs than prescribed adjunct therapies
RICE on Acute Ankle Sprains

• Article search from 1966 – 2010
  – Acute injuries identified and treated within 72 hours; 11 articles included
• Rest
  – Some immediate posttraumatic mobilization is beneficial vs. “rest”
• Ice
  – Limited evidence from randomized clinical trials supports ice as a treatment
• Compression
  – Limited evidence from randomized clinical trials evidence exists
  – No information provided about compression (type, amount, duration, position, etc)
• Elevation
  – No randomized clinical trials met the inclusion criteria of this study
• “Insufficient evidence is available from the randomized controlled trials to determine the relative effectiveness of RICE therapy”
• “Treatment decisions must be made on an individual basis, carefully examining the relative benefits and risks of each option, and be based on expert opinions and national guidelines”
RICE and Self-Management vs. RICE and Multimodal Physiotherapy

- Identified within 48 hours and followed for 11 days
- RICE and no therapy vs. RICE and formal therapy (ankle sprains)
- After 11 days no statistically difference in patient function between RICE and self-management vs. RICE with multimodal physiotherapy
  - RICE group took more medication vs. therapy group reported higher pain scores
  - RICE group had more total function improvement; therapy group had more improvement after day 3
  - Most RICE subjects requested formal therapy after 11 days
  - 85.5% used at least 1 component of RICE; 28.6% used all 4 components; 10.7% used no component of RICE before seeking care (28 subjects)

RICE on Anything Besides Ankle Sprains?

• Comparison of cold compression machine vs. cold pack application following shoulder arthroscopy

• Cold compression therapy resulted in no significant difference in pain at rest and upper-arm swelling reduction when compared to cold pack
  – 2, 8, and 24 hours after surgery

• Cold compression narrative review
  – Ankle sprains, knee ligament repair, TKA

• Cold compression therapy showed a slight positive trend compared to no treatment following acute injury
  – Unable to compare cold compression therapy to other modalities and treatments
    • Block, JE. Cold and Compression in the Management of Musculoskeletal Injuries and Orthopedic Operative Procedures: A Narrative Review. OA JSM. 2010: 1; 105-113.
Other Acute Care Protocols?
Other Treatment and Rehabilitation Protocols?

- **PRICE**
  - Protection, Rest, Ice, Compression, Elevation
- **POLICE**
  - Protection, Optimal Loading, Ice, Compression, Elevation
- **RICES**
  - Rest, Ice, Compression, Elevation, Stabilization
- **HI-RICE**
  - Hydration, Ibuprofen, Rest, Ice, Compression, Elevation
- **PRICES**
  - Protection, Rest, Ice, Compression, Elevation, Support
- **PRINCE**
  - Protection, Rest, Ice, NSAIDs, Compression, Elevation
- **RICER**
  - Rest, Ice, Compression, Elevation, Referral
- **DRICE**
  - Diagnosis, Rest, Ice, Compression, Elevation
PRICE Guidelines

• Most recommendations resulted in “Level C” evidence
  – Similar conclusions to the NATA and Australian ankle sprain statements

• “In view of the surprisingly limited amount of evidence in the literature to support definitive guidelines for the application of the PRICE regimen, it is apparent that further research is necessary to provide that evidence”
Calling the POLICE?

- PRICE → POLICE
- Exchanges “rest” for “optimal loading”
- “Rest” has a negative and passive connotation that may be harmful to tissue healing
- “Optimal loading” is more encompassing of a comprehensive treatment and rehabilitation program
- Theoretical; no identified studies on POLICE
- Treatment/rehabilitation program vs. acute care protocol
Primary Clinical Question Answered...

- **Patient** – Athletes with acute injury
  - Limited information on acute injuries
  - Less on “athletes”
- **Intervention** – RICE (rest, ice, compression, and elevation)
  - Limited information specifically on RICE; more on RICE-type interventions
- **Comparison** – Treatments other than RICE
  - Wide variety; unable to compare to any single treatment to RICE
- **Outcome**
  - Return to participation (primary)
    - Large review studies suggest no difference
    - Individual studies suggest some potential differences
    - Mostly low-level evidence pertaining to ankle sprains
  - Pain, edema, ROM, strength (secondary)
    - Laser on edema
    - No difference on pain, swelling, and function
    - Functional immobilization vs. “rest”
Clinical Bottom Line...

• Although each component of RICE has limited positive evidence on injury recovery there is little evidence available the combination of the four separate components improves clinical outcomes and return to activity

• RICE is an easily applied, recognized, and inexpensive first aid treatment, but lacks evidence of its effectiveness on injury healing and recovery

• No high-quality studies exist to validate the use of RICE as a beneficial initial or continuing treatment protocol vs. other protocols

• No safety issues identified specific to RICE

• Most studies examine the effectiveness of RICE on ankle sprains
  – No RICE specific articles found for any other body part or injury

• You should educate each patient about his/her available treatment option(s) and consider not using RICE as a treatment for every acute injury
Evidence Based Medicine “Triad”
If You Only Remember a Few Things….
Remember These…. 

• If you use RICE for every injury you are likely in the majority amongst
  AT’s and health care providers
  – “RICE is as American as apple pie”
• RICE is a safe treatment
• You may not need to use RICE for every acute injury or therapy session
  – You may end up at the same place
    • Patient compliance, supplies/resources/expense issues, billing, and CLINICIAN TIME
• The “ideal” RICE application time, elevation level, number of
  applications required for a positive effect to occur, etc have NOT yet
  been identified
• Discuss this topic and your protocols with your ________________ to
determine what is best for your patients and your health care setting
• If RICE was a drug would you purchase and consume it?
• If RICE was a surgery would you go under the knife?