

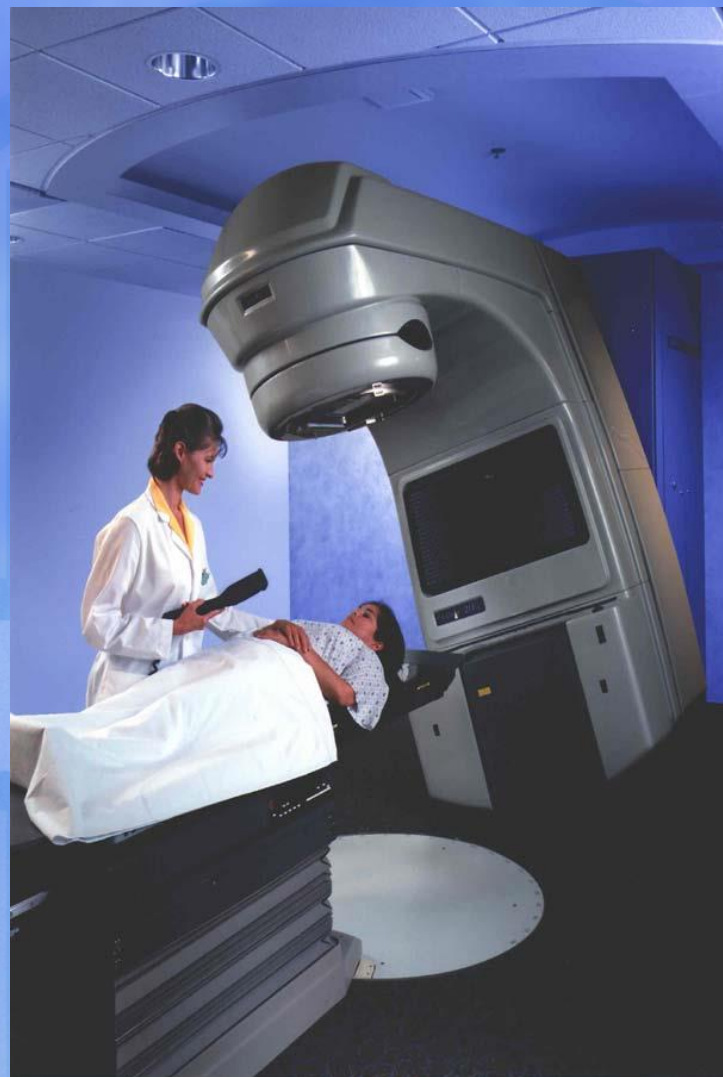
Precise Patient Positioning

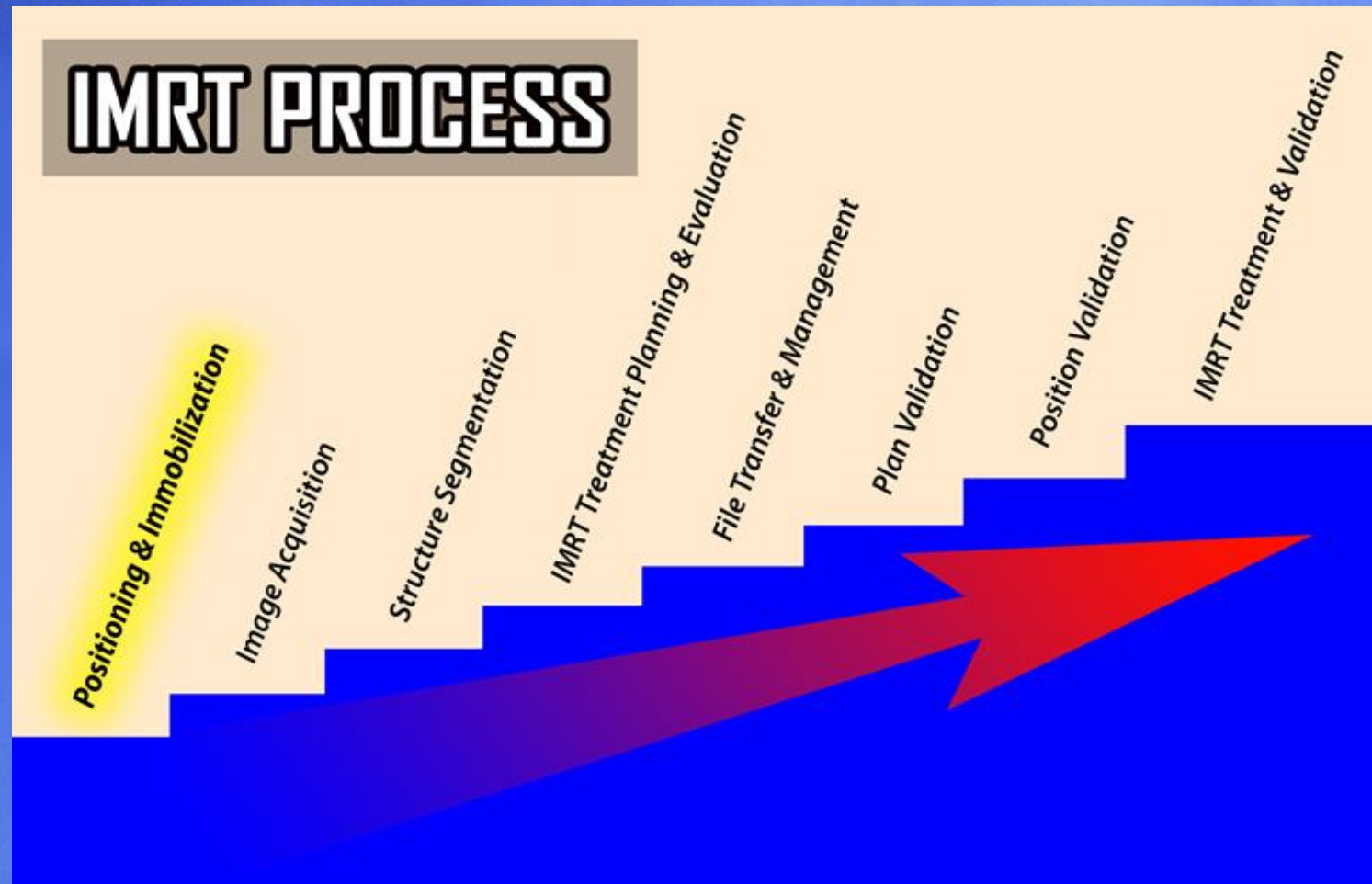
Immobilization for IMRT

Why IMRT?

- Increased Dose To Target Volume
 - Spare Adjacent Tissue
 - Tighter Margins With Fewer Complications
- ↳ Clinically Proven Better Local Control

**A Quality IMRT
Program *STARTS*
with Quality Set-Ups
and Precise
Immobilization**





- Patient positioning is the first step in the IMRT process
- Success depends on creating effective, comfortable, and reproducible setups

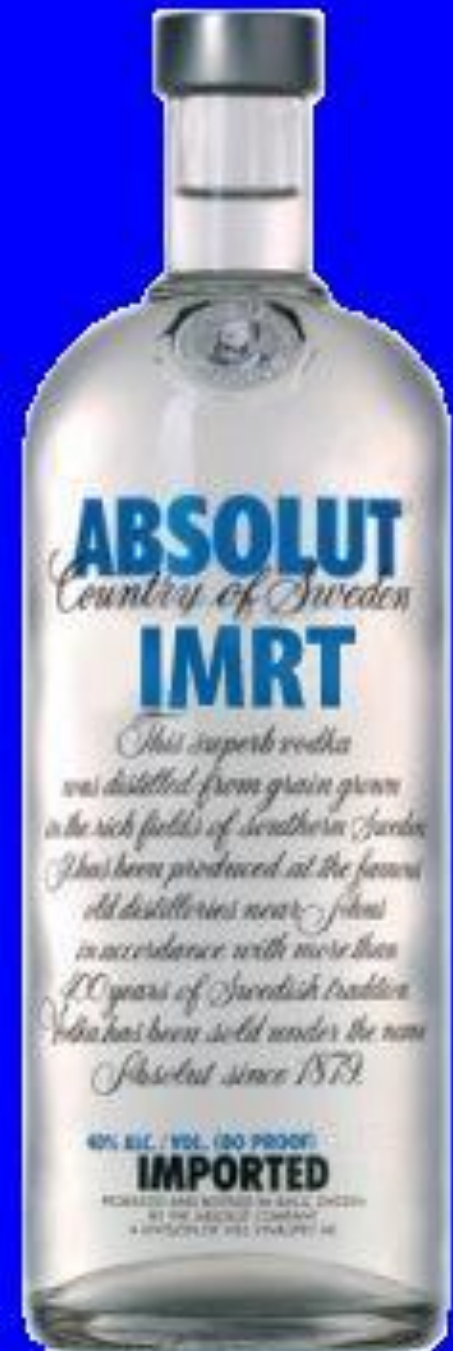
Immobilization Needs to be Revisited for IMRT

- The patient is on the table longer during simulation and treatment. The beam is on longer.
 - More fields, segmented fields, and multiple junctions within segmented fields.
 - Escalated Doses and Critical Structures
 - Tighter Margins = Greater Precision
- ❖ *Documentation of Immobilization is Required for IMRT*

“Perfect” IMRT Immobilization Means

- Absolute Precision
- Absolute Immobilization
- Absolute Radiolucency
- Absolute Reproducibility
- Absolute Verification
- Absolute Documentation

BUT WE DON'T LIVE IN A PERFECT WORLD!



Characteristics of IMRT Immobilization Devices

IMRT Immobilization Devices Must Meet Certain Criteria

- **Provide Highly Effective Immobilization**
- **Provide Comfortable Patient Setups**
- **Be Compatible With Newer Imaging Techniques (CT/MRI/PET)**
- **Be Reproducible and Documentable**
- **Work With Indexing Treatment Tabletops**
- **Produce Minimal Attenuation of Therapy Beam (Carbon Fiber Composites)**

Highly Effective Immobilization

For IMRT Patient Movement Must Be Restricted

- Escalated Doses
- Need to Spare Critical Structures (e.g. spine)
- Complex fields
- Tighter Margins
 - ❖ All require greater precision in dose delivery
- Longer Treatments
 - ❖ Patient movement increases as table time increases
- Customized Restraints and Supports are More Effective

Examples Include: Thermoplastic Masks

Customized Vacuum Cushions

Two-Part Foam

Bite Blocks

Enhanced Patient Comfort

- Extended Treatment Times Mean Longer Immobilization
- Patient movement increases as table time increases
- Immobilization Devices That Are Customized to Each Patient Provide Better Support and Comfort

*Examples Include: Thermoplastic Masks
Customized Vacuum Cushions
Two-Part Foam
Bite Blocks
MoldCare® Pillow*

Compatibility With Current Imaging Techniques

CT MRI PET

- Devices need to be compatible with current imaging technology. Newer modalities for patient imaging and treatment planning requires immobilization devices that will not interfere with the quality of that imaging.
- Some obvious and not so obvious factors to consider are:
 - Metal parts— cause artifact on CT scans, and if ferromagnetic can cause artifact or image degradation on MRI
 - Conductive coatings or materials— can also cause artifact or image degradation on MRI
 - Thick plastic parts can cause undesirable beam attenuation and complicate treatment planning
 - Large immobilization devices may not fit into the small bores of CT or MR scanners

Reproducible and Documentable

Setups Must Be Identical For Each Treatment Session

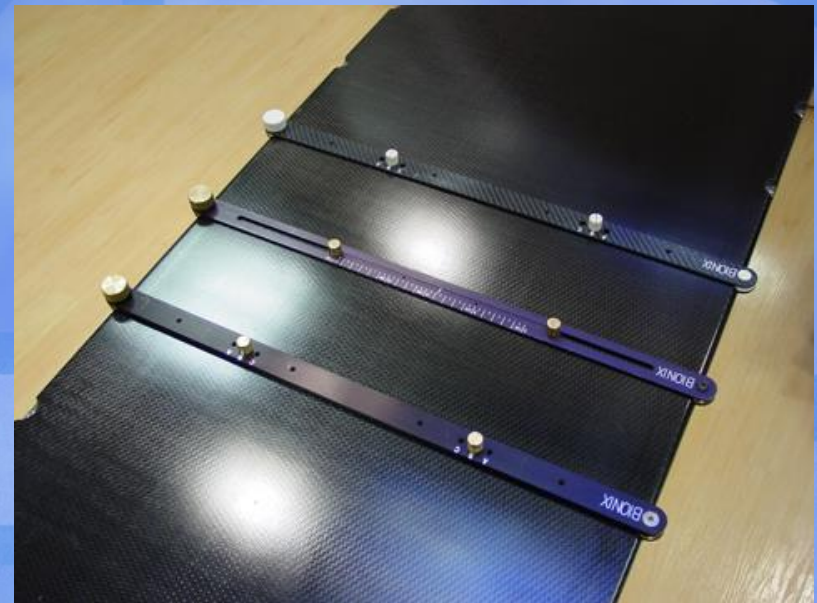
- Index To Tabletops
- Labeled Device Settings
- Provide Verification Of The Treatment Setup
- Documentable



Beekley Spot® Photo
courtesy of Beekley

Indexing Tabletops For IMRT

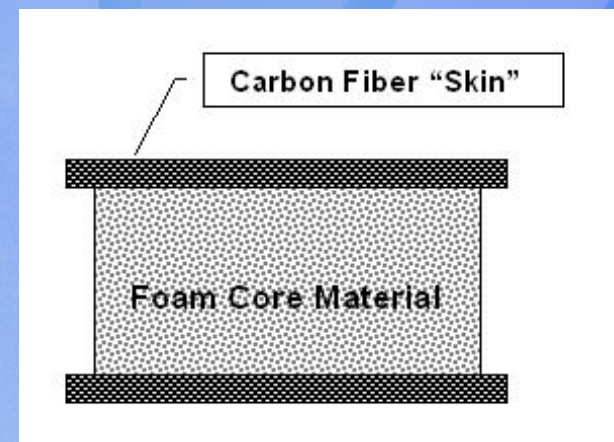
- More Than One Version Available
- Must Be On Simulators As Well As Therapy Machines
- Devices Index Using Lock Down Bars
- Indexing Points Are Labeled And Documentable
- Allow Efficient, Quick, and Reproducible Setups



Carbon Fiber Immobilization Devices

Why Carbon Fiber?

- Rigid and Rotationally Stable
- Low Attenuation
- Lightweight For Ease Of Use
- Accept Thermoplastic, Vacuum Bags, etc. For Customized Setups
- Adjustable, Reproducible, Documentable



Customizing Your Setups

Many Factors Affect Immobilization And Therapy

- Location of tumor and adjacent critical structures
- Patient Specific Individual Needs
 - ❖ Age
 - ❖ Size and Weight
 - ❖ Health and Flexibility
 - ❖ Special Needs (prosthetics, etc.)

Immobilization Decisions Based On

- Overall Effectiveness → *what works best in your facility*
- Available Resources → *maximize limited funds and space*
- Personal Preference → *experience counts!*
- Reimbursement → *insurance variability can dictate choices*

Billing for IMRT

- **Billing Includes**
 - Treatment planning
 - Mapping compensator blocks or using MLC
 - Patient setup for each therapy session
- **Based On Treatment Complexity**
 - Simple
 - Intermediate
 - Complex
- **Documentation Required To Justify Device Used**

Billing for IMRT (cont.)

- A typical course of radiation therapy will have 2-12 charges for devices depending on the complexity of treatment and treatment site
- Immobilization devices should be billed at simulation
- Treatment field devices should be billed at the beginning of treatment and later in the course of treatment if additional devices are required
- Only one device can be billed per port. Choose the device with the highest complexity.

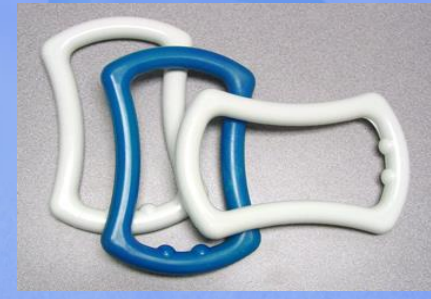
Billing Coding

- Billing codes are updated quarterly and published annually in *Current Procedural Terminology (CPT)*. These codes are defined by the ACR/ASTRO Joint Economics Committee.
- There is no national set of billing policies for Medicare.
- Each local Medicare carrier has some limited freedom to establish their own policies.
- IT IS VERY IMPORTANT TO CHECK WITH YOUR CARRIERS TO SEE IF SIGNIFICANT CODES HAVE BEEN UPDATED.

Simple Treatment Complexity Immobilization Devices

These are generally prefabricated, multi-Use devices.

- Blue Prone Pillow
- Rings
- Shoulder Retractors
- Silverman/Timo Head Supports
- Butterfly Boards



Intermediate Treatment Complexity Immobilization Devices

These facilitate use of other devices and/or have some level of adjustability.

- Belly Board
- Bite Blocks
- Breast Boards
- Pituitary Headholder
- Thigh Bolster



Complex Treatment Complexity Immobilization Devices

Devices can be customized for each patient.

- Two-Part Foam
- Custom Head Supports
- Thermoplastic
 - ❖ Documentation is
- Vacuum Cushions



Verification Techniques For IMRT

- Treatment target volume must be verified before each therapy session
- Verification may rely on:
 - External Landmarks
 - Device Associated Markings
 - Internal Fiducials

Verification Techniques For IMRT

External Landmarks

- **Ink tattoos**
 - Still the most popular and commonly used method.
 - Uses a small tattoo as a fiducial marker for laser alignment.
 - Relies on permanence and relation of skin markings to internal structures.
 - Drawback is body mass loss during the course of a treatment regimen.
- **Skin Markers (EZ Port[®], Beekley Spots[®])**

Verification Techniques For IMRT

Device Associated Markings

- **Indexing Tabletops**

- Immobilization device indexed to treatment tabletop.
- Simple, documentable, and reproducible.
- Can not definitively localize internal organs/ target treatment volumes.

- **Labeled Device Markings**

- Note settings of board angles, arm supports , etc.
- Simple, documentable, and reproducible.
- Can not definitively localize internal organs/ target treatment volumes.

Verification Techniques For IMRT

Internal Fiducials

- **Implanted Fiducial Markers (Gold Seeds)**
 - Permanently implanted seed visible through imaging
 - Provides positive verification of target treatment volume
 - Invasive; requires surgical or transcutaneous placement
 - Greater cost
- **Daily Imaging**
 - Ultrasound (BAT)
 - CT/ MRI
- **Helical Tomotherapy**

Immobilization and Internal Organs

- Immobilization by itself is insufficient to localize internal organs.
 - Respiration, tissue loss, and other factors play a role
 - Target organs can migrate significantly between treatment sessions

Location of Target Volume Must Be Verified Before Each Treatment

- Optimal Solution: Use immobilization in conjunction with image guided localization (IGRT).

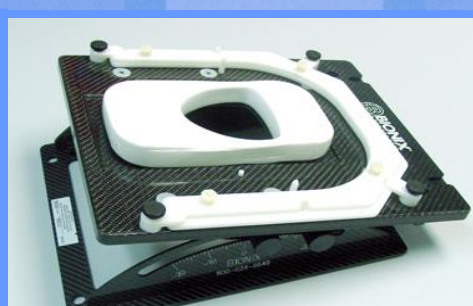
Localization of Internal Organs in IMRT IGRT Techniques

- **Respiratory Gating**
 - *Camera driven system to match therapy to respiratory cycle*
- **External Fiducial Markers**
 - *Therapy requires localization of fiducial skin markers*
- **Daily BAT (B-Mode Acquisition and Targeting) Ultrasound Imaging**
 - *This is a 2-5 minute noninvasive procedure that is much easier to facilitate than daily CT scans.*
- **Internal Fiducial Markers**
 - *Gold seed implants visible through imaging*
- **Helical Tomotherapy**
 - *A CT like image that is produced in synchronicity to treatment.*



Common Setup Scenarios

- Prostate
 - Supine
 - Prone
- Head/ Neck/ Brain
- Breast/Lung/Thorax



Setup Scenario

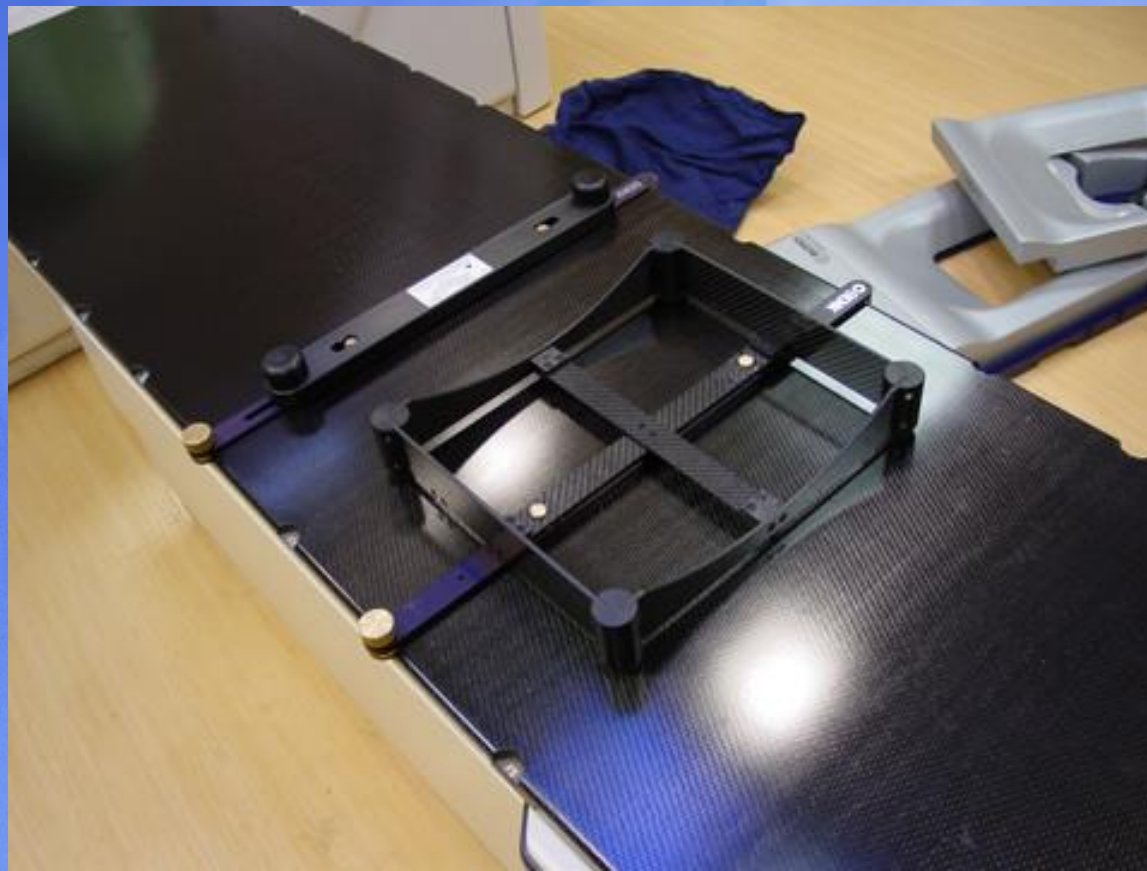
IMRT Prostate (Supine)

- Most popular method.
- Use a customized vacuum cushion or two-part foam (A popular and effective method is to immobilize from the lower gluteal fold to the heels encompassing the feet).
- Lock your mold to the indexing treatment tabletops using lock down bars.
- Use image guided systems, BAT, or seed implants to localize your target at the time of treatment.
- Bill as Complex Treatment

Supine Prostate Setup With Indexed Vacuum Cushion



Indexing Adaptors for Vacuum Cushions



Setup Scenario IMRT Prostate (Prone)

Prone Positioning

- Use a belly board, adjusting for patient size.
 - *Position the patient comfortably dropping the belly through the abdominal opening.*
 - *Run your simulation, align and tattoo.*
 - *Immobilize the patient to the belly board with a sheet of thermoplastic.*
 - *Ease laser alignment by cutting holes in the thermoplastic.*
- Lock your belly board to the indexing treatment tabletop using lock down bars.
- Internal immobilization can be used (ex: rectal balloon).
- Use image guided systems, BAT or seed implants to localize target at the time of treatment.
- Bill as Intermediate Treatment

Prone Prostate Setup With Belly Board



Prone Prostate Setup With Belly Board

Belly Board With Patient Customized Thermoplastic Mold Attached



Prone Prostate Setup Immobilization of Prostate Using Rectal Balloon

- The prostate can move up to 6 mm daily in the A/P direction and 3-5 mm in the S/I direction
- Prostate movement greater with patients in prone position
- The use of a rectal balloon significantly reduces prostate motion by pushing the prostate against pelvic bone

Prostate Treatment

Supine vs. Prone Comparison

SUPINE

Supine Treatment Plan:

- Full bladder
 - Daily BAT
 - Higher daily dose
 - Lower total dose
 - Shorter treatment cycle
- Preferred by therapists for ease of setup.
 - More comfortable for patients.
 - Complex coding for billing.

PRONE

Prone Treatment Plan:

- Empty bladder
 - Lower daily dose
 - Higher cumulative dose
 - Extended course of treatment
- Provides better fixation and displacement of the small bowels.
 - Typically requires more adjustments and patients have difficulties using belly boards.
 - Intermediate complexity coding for billing.

Setup Scenario

IMRT Head/Neck/Brain

- Setup patient with head in supine position
- Use a carbon fiber headboard or head and shoulder system
 - Index the device to the treatment tabletop using lock down bars.
 - Use shoulder retractors or suppression system to properly position shoulders.
- Use customized head and neck support and thermoplastic mask for each patient
- Bite blocks can be molded into the thermoplastic for additional immobilization and rotational fixation

Head/Neck/Brain Setup With Head and Shoulder System



Head/Neck/Brain Setup With Head and Shoulder System



Specialized Headboard Systems For Head/Neck/Brain IMRT

Prone Tilt Attachment



45 Degree Tilt Attachment



Thermoplastic For IMRT



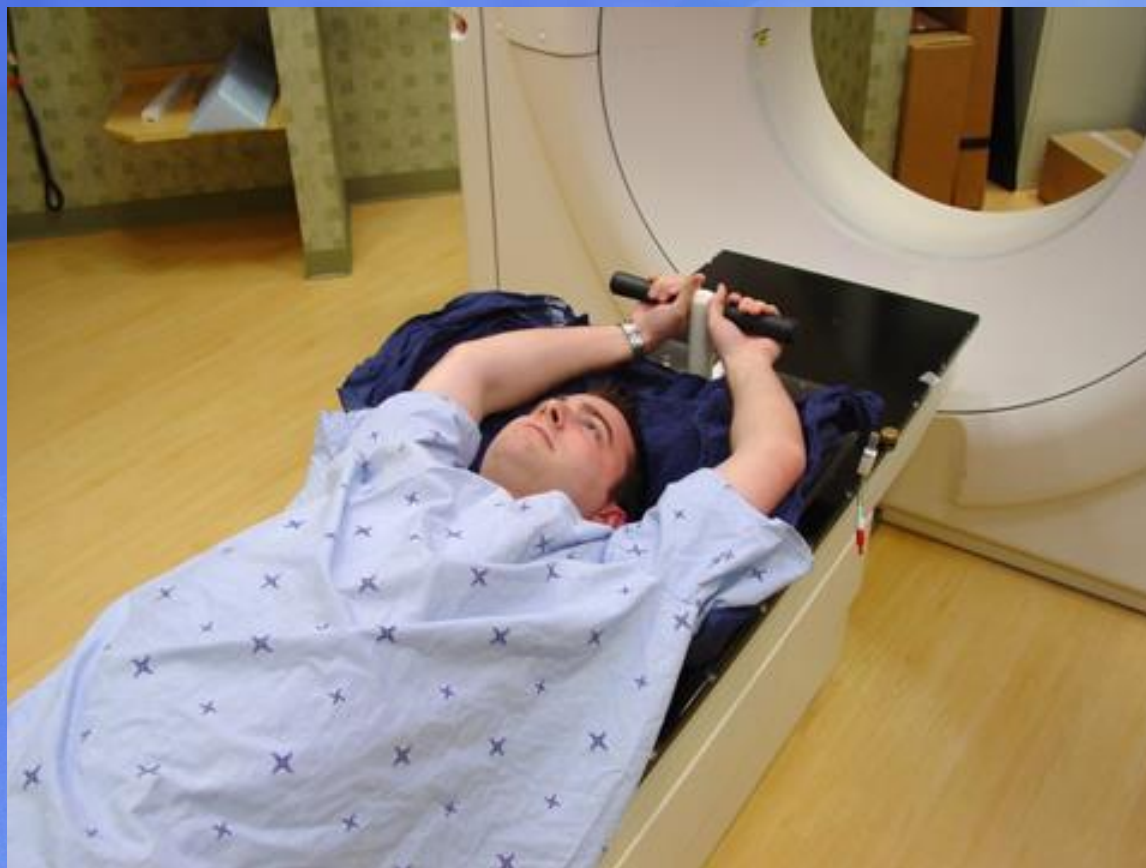
- Thicker gauge or reinforced (3.2mm)
- Greater immobilization and rigidity
- Reinforced for greater rotational stability
- More scatter with thicker thermoplastics
- Higher likelihood for skin effects

Setup Scenario

IMRT Breast/Lung/Thorax

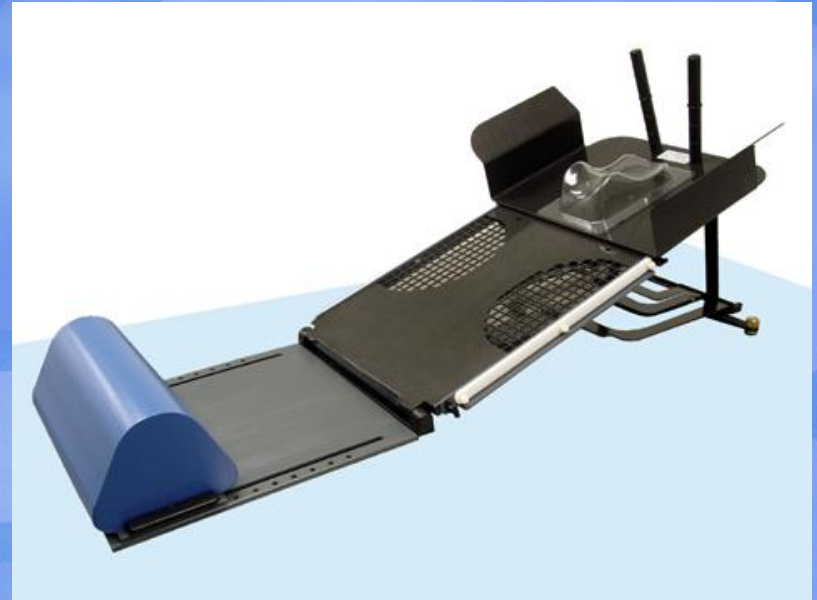
- Position patient supine with arms raised above the head
- Use a customized vacuum cushion or two-part foam with a butterfly board or extended butterfly board
- Index the butterfly board to the treatment tabletop using lock down bars
- Use respiratory gating or IGRT to account for patient breathing cycles

Breast/Lung Setup With Indexed Butterfly Board



Breast/Lung Setup With Indexed With Breast Boards

- Highly radiolucent/ Open grid panels allow flexible treatment
- Indexable and Documentable
- Multiple Angles for Patient Positioning
- Narrow boards better for small bore CT scanners
- Use with thermoplastic, etc. for complex billing



Basic Breast Setup in the Prone Position



- Lock the Breast Board onto your couch using an indexable lockdown bar.
- Position the patient by having them climb onto the board from the bottom end. Place the saddle into the most comfortable position, or remove completely if unnecessary.
- Position the Breast Bridge so that the contra lateral breast rests comfortably out of the treatment field.
- Position the face cushion into the most comfortable position for the patient. Note the labeled setting.
- Use the Ruled Edge that runs along the base to align the patient for treatment.
- Thermoplastic sheets may be used to immobilize the pelvic region for a complex treatment scenario.
- If all indexing aspects of the board are utilized, and *proper documentation is acquired*, the breast will naturally fall into the same position everyday.



Buying Immobilization Devices

- Obtain Price Quotes from Multiple Vendors.
 - *This is a common practice, two or three different quotes may yield some unexpected results.*
 - *Be sure to inquire about Warranties, Accessories, Money Back Guarantees, and future Upgrades.*
- There are no industry standards, compare apples to apples.
 - *Some items might come as a complete set, some might require many additional accessories*
- Use the devices before you invest.
 - *Most manufacturers offer free Trial Evaluations or some kind of money back guarantee.*
- Take advantage of the in-service.
 - *This will often lead to not only a free lunch, but also better pricing and a better relationship with your Representative.*

Thank You!!

