In Bed and Out of Bed Mobility: Evidence based Strategies for Making it Happen

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Learning Objectives

At the completion of this activity, the participant will be able to:

1. Create the link of patient advocacy to mobilizing critically ill patients
2. Identify and discuss key in-bed and out of bed mobility techniques to successfully achieve your early mobility protocol to improve patient outcomes.
3. Overcoming barriers and feeling empowered to own patient mobility within your unit.

Notes on Hospitals: 1859

“It may seem a strange principle to enunciate as the very first requirement in a Hospital that it should do the sick no harm.”

Florence Nightingale

Advocacy = Safety

Protect The Patient From Bad Things Happening on Your Watch

Implement Interventional Patient Hygiene

Interventional Patient Hygiene

- Hygiene…the science and practice of the establishment and maintenance of health
- Interventional Patient Hygiene….nursing action plan directly focused on fortifying the patients host defense through proactive use of evidence based hygiene care strategies

Incontinence Associated Dermatitis Prevention Program

Comprehensive Oral Care Plan

Hand Hygiene

Catheter Care

Bathing & Assessment

Pressure Ulcer Prevention
Impact of Immobility

- Increase atelectasis and risk for VAP/HAP
- Fluid shifts, cardiac deconditioning and orthostatic intolerance
- Pressure ulcers from shear, friction, moisture and pressure risk factors
- 74% of patients developed delirium during hospital stay & at 3 months 40% had global cognition scores 1.5 SD below population mean
- ICU patients up to 5 years experience severe weakness & deficits in self care, poor quality of life & readmission.
- One day of bed rest requires two weeks of reconditioning to restore baseline muscle strength

Outcomes of Early Mobility Programs

- ↓ incidence of VAP
- ↓ time on the ventilator
- ↓ days of sedation
- ↓ incidence of skin injury
- ↓ delirium
- ↑ ambulatory distance
- Improved function

Thomsen GE, et al. CCM 2008;36:1119-1124
Winkelman C et al, CCN,2010;30:36-60

Early Mobility Protocol: Impacting Outcomes

- Morris, et al, conducted a prospective cohort study to determine the impact of early mobility therapy using a team on patients who were mechanically ventilated with respiratory failure
- The control group received standard passive ROM and turning (n=165)
- The study group received low-impact mobility by a team (n=165)
  - Therapy initiated within 48 hours of mechanical ventilation
  - Therapy 7 days/week until ICU discharge
  - Mobility team included 1 ICU nurse, 1 physical therapist, and 2 nursing assistants

Early ICU Mobility Therapy

**Results**

- Baseline characteristic similar in both groups
- Protocol group:
  - Received at least 1 PT session vs. usual care (80% vs. 47%, p < .001)
  - Out of bed earlier (5 vs. 11 days, p < .001)
  - Reduced ICU LOS (5.5 days vs. 6.9 days, p=.025)
  - Reduced Hospital LOS (11.2 days vs. 14.5 days, p =.006)
  - No adverse outcomes;
    - Most frequent reason for ending mobility session was patient fatigue
- Cost
  - Average cost per patient was $41,142 in the protocol group
  - Average cost per patient was $44,302 in the control group


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Early Physical and Occupational Therapy in Mechanically Ventilated Patients

- Prospective randomized controlled trial from 2005-2007
- 1161 screen, 104 patients mechanically ventilated < 72hrs, functionally independent at baseline met criteria
- Randomized to:
  - early exercise of mobilization during periods of daily interruption of sedation (49 pts)
  - daily interruption of sedation with therapy as ordered by the primary care team (55 pts)
- Primary endpoint: number of patients returning to independent functional status at hospital discharge able to perform activities of daily living and walk (independently)

Early Physical and Occupational Therapy in Mechanically Ventilated Patients


- **Safe**
- Well tolerated
- ↓ duration of delirium
- ↑ VFD
- Functional independence at discharge
  59% protocol group vs. 35% in control arm
Use of a of a Mobility Bundle Toolkit and Technology in a Neurointensive Care Unit

(Appendix A) Neurointensive Care Unit Progressive Upright Mobility Protocol (PUMP) Plus Algorithm

START HERE...

- All patient admitted over 16 month period
- 10 month pre-obs - 6 month post
- 100% Nurse-driven protocol
- One protocol for nurses to follow; all patients
- Mobility goals for patients with or without deconditioning
- Defined steps beyond “chair” to better prepare patients for discharge, earlier
- End point mobility goals similar to outpatient PT goals

Modified from The University of Kansas Hospital Progressive Mobility Algorithm for Critically Ill Patients (http://www.aacn.org/wd/nti2009/nti_cd/data/papers/main31710.pdf) © Shands at the University of Florida, 2010 Courtesy of J Hester.

Use of a of a Mobility Bundle Toolkit and Technology in a Neurointensive Care Unit (NICU)

Mobility was increased among the NICU care patients by 300%

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Before Mobility</th>
<th>After Mobility</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>patient days</td>
<td>April 1, 2010 - Jan 31, 2011</td>
<td>Feb 11 - June 31, 2011</td>
<td>0.12</td>
</tr>
<tr>
<td>neurointensive care unit LOS (days)</td>
<td>4.00 ± 0.31</td>
<td>3.46 ± 0.31</td>
<td>&lt;0.004</td>
</tr>
<tr>
<td>acquired pressure ulcer prevalence</td>
<td>2.65% ± 0.03</td>
<td>4.57% ± 0.02</td>
<td>0.22</td>
</tr>
<tr>
<td>days in restraints</td>
<td>368.57 ± 46.8</td>
<td>301.2 ± 55.3</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>hospital acquired infections</td>
<td>5.6 ± 0.9</td>
<td>2.2 ± 1.0</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>VAP† rate†</td>
<td>7.22 ± 1.17</td>
<td>1.07 ± 1.62</td>
<td>0.11</td>
</tr>
<tr>
<td>% of patients ventilated</td>
<td>32.0 ± 0.03</td>
<td>30.6 ± 0.07</td>
<td>0.66</td>
</tr>
<tr>
<td>ventilator days</td>
<td>265 ± 27.3</td>
<td>231 ± 70.7</td>
<td>0.39</td>
</tr>
<tr>
<td>ventilator days</td>
<td>100.0 ± 3.5</td>
<td>100.0 ± 3.5</td>
<td>1.00</td>
</tr>
<tr>
<td>ventilator days</td>
<td>1.4 ± 0.7</td>
<td>1.4 ± 0.7</td>
<td>1.00</td>
</tr>
<tr>
<td>ventilator days</td>
<td>1.53 ± 0.53</td>
<td>1.07 ± 0.81</td>
<td>0.63</td>
</tr>
<tr>
<td>ventilator days</td>
<td>1.10 ± 0.67</td>
<td>0.91 ± 1.12</td>
<td>0.766</td>
</tr>
</tbody>
</table>

* All data represented as mean ± SD unless otherwise noted
† Rates are per 1000 days

Protocol Driven Mobility Program: Impacting NICU Outcomes

- Pre-post intervention study
- Large academic NICU
- 637 patients
  - 260 pre
  - 377 post
- Intervention: Early Progressive Mobility Protocol
  - Exclusion criteria
  - Readiness criteria
  - Started on admission
  - Encourage to use ICU bed features & lifts to assist
  - Protocol place at bedside


Multivariate analysis done to control for group differences:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Physiology and Chronic Health Evaluation III score*</td>
<td>59.0 (2.54)</td>
<td>56.7 (2.54)</td>
<td>0.90</td>
</tr>
<tr>
<td>Length of stay</td>
<td>15.15 (3.95)</td>
<td>10.21 (3.04)</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Neurological/ICU d (ms)</td>
<td>7.37 (0.68)</td>
<td>4.75 (0.64)</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Psychological factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression, mean (se)</td>
<td>0.76 (0.22)</td>
<td>0.51 (0.22)</td>
<td>0.12</td>
</tr>
<tr>
<td>Anxiety, mean (se)</td>
<td>0.69 (0.21)</td>
<td>0.42 (0.21)</td>
<td>0.008</td>
</tr>
<tr>
<td>Hostility, mean (se)</td>
<td>0.38 (0.14)</td>
<td>0.27 (0.14)</td>
<td>0.31</td>
</tr>
<tr>
<td>Combined, mean (se)</td>
<td>1.80 (0.50)</td>
<td>1.21 (0.41)</td>
<td>0.11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest mobility achieved</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 7†</td>
<td>1.03 (1.15, 2.33)</td>
<td></td>
<td>0.005</td>
</tr>
<tr>
<td>Level 6†</td>
<td>1.92 (1.43, 2.68)</td>
<td></td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Level 5†</td>
<td>1.18 (1.39, 2.41)</td>
<td></td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Mortality 30 d</td>
<td>0.66 (0.58, 1.59)</td>
<td></td>
<td>0.87</td>
</tr>
<tr>
<td>Discharge home</td>
<td>1.55 (1.69, 2.27)</td>
<td></td>
<td>0.038</td>
</tr>
<tr>
<td>Deep ven thrombosis</td>
<td>1.90 (1.60, 3.00)</td>
<td></td>
<td>0.65</td>
</tr>
<tr>
<td>Deep ven thrombosis*</td>
<td>1.73 (1.61, 3.13)</td>
<td></td>
<td>0.072</td>
</tr>
<tr>
<td>Deep ven thrombosis†</td>
<td>1.52 (1.33, 1.99)</td>
<td></td>
<td>0.18</td>
</tr>
</tbody>
</table>

ABCDE Bundle Reduces Ventilation, Delirium & OOB

- 18 month, prospective, cohort, before-after study
- 5 adult ICU’s, 1 step down, 1 oncology unit
- Compared 296 patients (146 pre-bundle) & 150 post bundle
- Intervention: ABCDE
- Measured:
  - For mechanical ventilation patients (187) examined ventilator free days
  - All patients examined incidence of delirium, mortality, time to discharge and compliance with the bundle

Driving Change

- Gap analysis
- Build the Will
- Protocol Development

Structure + Process = Outcomes

- Make it Prescriptive
- Overcoming barriers
- Daily Integration

Early Mobility

Progressive Mobility:
Planned movement in a sequential manner beginning at a patient's current mobility status and returning them to baseline & includes:

- Head elevation
- Manual turning
- Passive & Active ROM
- Continuous Lateral Rotation Therapy/Prone Positioning
- Movement against gravity
- Physiologic adaptation to an upright/leg down position (Tilt table, Bed Egress)
- Chair position
- Dangling
- Ambulation

The Mobility Initiative

- Objective
  - To create a progressive mobility initiative that will help ICU teams to address key cultural, process and resource opportunities in order to integrate early mobility into daily care practices.
- Methods
  - Multi-center implementation of key clinical interventions
  - An evidence-based, user-friendly progressive mobility continuum was developed, lead by the Clinical Nurse Specialist faculty
  - Implementation plan: process design, culture work & education
  - 130 patients/3120 prospectively collected hourly observations
  - Qualitative and quantitative data collected
    - 15 process and 5 outcome metrics
  - Results reported as cohort and unit specific data
Determining Readiness

- Perform Initial mobility screen w/in 8 hours of ICU admission & daily
  - PaO2/FiO2 > 250
  - Peep < 10
  - O2 Sat > 90%
  - RR 10-30
  - No new onset cardiac arrhythmias or ischemia
  - HR > 60 < 120
  - MAP > 55 < 140
  - SBP > 90 < 180
  - No new or increasing vasopressor infusion
  - RASS > -3

**Patient Stable, Start at Level II & progress**

Patient is unstable, start at Level I & progress

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**Progressive Mobility Continuum**

<table>
<thead>
<tr>
<th>START HERE</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th>LEVEL IV</th>
<th>LEVEL V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform Initial mobility screen w/in 8 hours of ICU admission</td>
<td>RASS -5 to -3</td>
<td>RASS -3 &amp; up</td>
<td>RASS -1 &amp; up</td>
<td>RASS 0 &amp; up</td>
<td>Goal: Increase distance in ambulation &amp; ability to perform some ADLs</td>
</tr>
</tbody>
</table>

**LEVEL I**

- Goal: Clinical stability
- Passive ROM
- No new onset cardiac, arrhythmias or ischemia
- HR > 60 < 120
- MAP > 55 < 140
- SBP > 90 < 180
- No new or increasing vasopressor infusion
- RASS > -3

**LEVEL II**

- Goal: Sitting upright
- Increased trunk strength, moves leg against gravity and readiness to weight bear
- PT consultation prn
- OT consultation prn

**LEVEL III**

- Goal: Stands w/min.
- Must assist
- Able to march in place, weight bear and transfer to chair
- PT x 2 daily & OT x 2 daily

**LEVEL IV**

- Goal: Stands w/min.
- Must assist
- Able to march in place, weight bear and transfer to chair
- PT x 2 daily & OT x 2 daily

**LEVEL V**

- Goal: Stands w/min.
- Must assist
- Able to march in place, weight bear and transfer to chair
- PT x 2 daily & OT x 2 daily

---

*Mobility is the responsibility of the RN, with the assistance from the PT/OT. PT and OT may assist the team with placement to the appropriate mobility level of activity, always prioritizing patient and provider safety. Placement is based on clinical judgment.*
Do We Even Achieve the Minimum Mobility Standard… “Q2 Hours”? 

Body Position: Clinical Practice vs. Standard

• Methodology
  – 74 patients/566 total hours of observation
  – 3 tertiary hospitals
  – Change in body position recorded every 15 minutes
  – Average observation time 7.7 hours
  – Online MD survey
• Results
  – 49.3% of observed time no body position change
  – 2.7% had a q 2 hour body position change
  – 80-90% believed q 2 hour position change should occur but only 57% believed it happened in their ICU
Positioning Prevalence

- Methodology
  - Prospectively recorded, 2 days, 40 ICU's in the UK
  - Analysis on 393 sets of observations
  - Turn defined as supine position to a right or left side lying

- Results:
  - 5 patients prone at any time, 3.8% (day 1) & 5% (day 2) rotating beds
  - Patients on back 46% of observation
  - Left 28.4%
  - Right 25%
  - Head up 97.4%
  - Average time between turns 4.85 hrs (3.3 SD)
  - No significant association between time and age, wt, ht, resp dx, intubation, sedation score, day of wk, nurse/patient ratio, hospital

Goldhill DR et al. Anaesthesia 2008;63:509-515

Achieving In-Bed Mobility
Current Practice: Turn & Reposition

- 70% Disposable Slide Sheets
- Draw Sheet/Pillows/Layers of Linen
- Lift Device
- Transfer Device
- Specialty Beds

50% of nurses required to do repositioning suffered back pain
- High physical demand tasks
  - 31.3% up in bed or side to side
  - 37.7% transfers in bed
- 40% of critical care unit caregivers performed repositioning tasks more than six times per shift
- Number one injury causation activity: Repositioning patients in bed

Harber P, et al. J Occupational Medicine, 27;518-524
Fragala G. AAOHN, 2011;59:1-6
Occupational Injuries RN’s with Musculoskeletal Disorders in US, 2003 – 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Ownership</th>
<th>Occupation</th>
<th>Total Cases</th>
<th>Incidence Rate</th>
<th>Medical Days Away From Work</th>
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<tbody>
<tr>
<td>2009</td>
<td>private industry</td>
<td>RNs</td>
<td>6,760</td>
<td>51.6</td>
<td>8</td>
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<tr>
<td></td>
<td>local government</td>
<td>RNs</td>
<td>1,060</td>
<td>55.0</td>
<td>7</td>
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<tr>
<td></td>
<td>state government</td>
<td>RNs</td>
<td>560</td>
<td>56.1</td>
<td>14</td>
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<tr>
<td>2010</td>
<td>Private industry</td>
<td>RNs</td>
<td>9,260</td>
<td>53.7</td>
<td>6</td>
</tr>
<tr>
<td>2011</td>
<td>Private industry</td>
<td>RN’s</td>
<td>10,210</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>state government</td>
<td>RNs</td>
<td>540</td>
<td>-</td>
<td>9</td>
</tr>
</tbody>
</table>


Achieving the Use of the Evidence For In-Bed & Out of Bed Mobility for Maximum Outcomes

Factors Impacting the ability to Achieve Quality Nursing Outcomes at the Point of Care

Resource & System
- Breathable glide sheet/stays
- Foam Wedges
- Microclimate control
- Reduce layers of linen
- Wick away moisture body pad

Attitude & Accountability

Comparative Study of Two Methods of Turning & Positioning

- Blocked design with convenience sample of 60 patients
- SOC: pillows/draw sheet
- TAP: breathable glide sheet/foam wedges/wick away pad

Results:
- Nurse satisfaction 87% versus 34%
- 30° turn achieved versus -0-15 in SOC
- SOC group required more resources

<table>
<thead>
<tr>
<th></th>
<th>SOC</th>
<th>TAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time on Product</td>
<td>7 days (1-29)</td>
<td>7 days (1-45)</td>
</tr>
<tr>
<td>Age</td>
<td>57.72 (SD 18.45) (18-88)</td>
<td>57.73 (SD 17.87) (29-92)</td>
</tr>
<tr>
<td>Gender</td>
<td>14 Female 18 male</td>
<td>10 Female 20 Male</td>
</tr>
<tr>
<td>Braden</td>
<td>12.77</td>
<td>13.23</td>
</tr>
<tr>
<td>Mobility</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>BMI</td>
<td>30.62</td>
<td>30.97</td>
</tr>
<tr>
<td>PU development</td>
<td>0</td>
<td>1*</td>
</tr>
<tr>
<td>Pulled up in bed</td>
<td>3.38</td>
<td>2.58</td>
</tr>
<tr>
<td>Number to turn</td>
<td>1.97</td>
<td>1.35</td>
</tr>
</tbody>
</table>

Powers J. Presented at 27th Annual Symposium of Advances in Skin and Wound Care, Las Vegas, NV; 10/20-23, 2012...in press

Safe Patient Handling Initiative: Decreases Staff Musculoskeletal Injuries & Patient Pressure Ulcers

- QI: before & after study
- Metrics; number of HAPUs, the number of healthcare worker injuries associated with repositioning.
- The EB Cost of HCW injury was $22,500.
- The EB cost for HAPUs was $2,000 for stage I and II ulcers and $43,180 for stage III and IV ulcers.

Comparison:
- SOC: Offloading with chucks, pillows, and rolled blankets as necessary.
- Intervention: Use of a heel offloading device* and patient turning and repositioning device**.

Way H. Presented at the 2014 Safe Patient Handling East Conference on March 27, 2014
Safe Patient Handling Initiative: Decreases Staff Musculoskeletal Injuries & Patient Pressure Ulcers

Presented at the 2014 Safe Patient Handling East Conference on March 27, 2014

Out of Bed Technology
Current Seating Positioning Challenges

Uncomfortable

- Airway & Epiglottis compressed
- Lack of Body Alignment
- Shear/Friction
- Sacral Pressure

Frequent repositioning & potential caregiver injury
Potential fall risk

Repositioning Patients in Chairs: An Improved Method (SPS)

- Study the exertion required for 3 methods of repositioning patients in chairs
- 31 care giver volunteers
- Each one trial of all 3 reposition methods
- Reported perceived exertion using the Borg tool, a validated scale.

Method 1: 2 care givers using old method of repositioning
246% greater exertion than SPS

Method 2: 2 caregivers with SPS
Method 3: 1 caregiver with SPS
52% greater exertion than method 2

Progressive Mobility: Use of Technology to In-Bed & Out of Bed Mobility

Journey to tolerating upright position, turning, tilt, sitting, standing and walking and out of bed chair sitting can occur quicker through the use of technology

“Even if you are on the right track, you will get run over if you just sit there.”

Will Rogers
Early Mobility: Can We Do It? Is it Safe?

Challenges to Mobilizing Critically Ill Patients

- Human or Technological Resources
- Knowledge/Priority
- Safety
- Hemodynamic instability
Safety

• > 1 % adverse events during 1449 sitting, standing and walking sessions with patients on ventilators.
• Underwent daily sedation interruption followed by PT & OT daily until achieving physical function independence
  – Safety events occurred in 16% of all sessions
    • Loss of 1 arterial line, 1 nasogastric tube, 1 rectal tube
  – Therapy was stopped on 4% of all sessions for vent asynchrony, agitation, or both
  – Delirium present 53% of the time during therapy sessions


Hemodynamic Instability

???

Is it a Barrier to Positioning?
The Role of Hemodynamic Instability in Positioning\textsuperscript{1,2}

- Lateral turn results in a 3\%-9\% decrease in SVO\textsubscript{2}, which takes 5-10 minutes to return to baseline
- Appears the act of turning has the greatest impact on any instability seen
- Minimize factors that contribute to imbalances in oxygen supply and demand
- Factors that put patients at risk for intolerance to positioning:\textsuperscript{3}
  - Elderly
  - Diabetes with neuropathy
  - Prolonged bed rest
  - Low hemoglobin and cardiovascular reserve
  - Prolonged gravitational equilibrium

\textsuperscript{2} Price P. Dynamics. 2006;17:12-19.
\textsuperscript{3} Vollman KM. Crit Care Nurs Q. 2013;36:17-27

Decision-Making Tree for Patients Who Are Hemodynamically Unstable With Movement\textsuperscript{1,2}

- Screen for mobility readiness within 8 hrs of admission to ICU & daily initiate in-bed mobility strategies as soon as possible
- Is the patient hemodynamically unstable with manual turning?
  - \textsuperscript{3}O\textsubscript{2} saturation < 90%
  - New onset cardiac arrhythmias or ischemia
  - HR < 60 > 120
  - MAP < 50 > 140
  - SPB < 90 > 180
  - New or increasing vasopressor infusion
- Is the patient still hemodynamically unstable after allowing 5-10 minutes’ adaption post-position change before determining tolerance?
- Screen for mobility readiness within 8 hrs of admission to ICU & daily initiate in-bed mobility strategies as soon as possible
- Has the manual position turn or HOB elevation been performed slowly?
- Intiate continuous lateral rotation therapy via a protocol to train the patient to tolerate turning

\textsuperscript{1} Vollman KM. Crit Care Nurse. 2012;32:70-75.
\textsuperscript{2} Vollman KM. Crit Care Nurs Q. 2013;36:17-27.

HOB=head of bed; HR=heart rate; MAP=mean arterial pressure; SPB=systolic blood pressure.
It Takes a Village

Ensuring Safety & Success

- Mobility readiness assessment
- Determining absolute contraindications for any mobility protocol
- Criteria for stopping a mobility session
- Changing the culture
- Sufficient resources and equipment to make it easy & safe to do
Be Courageous

We all are responsible for the safety of our patients and ourselves……Own the Issues

• “If not this, then what??”
• “If not now, then when?”
• “If not me, then who??”