Situation: Mobility has been recognized as a component to prevent deconditioning. However, the literature reveals that hospitalized adults rarely walk a significant distance. Early and frequent mobilization and ambulation of hospitalized patients shows promise as a nurse-initiated intervention impacting nurse/patient sensitive outcomes such as length of stay (LOS) and exercise capacity, as well as overall disease morbidity and mortality.

Background: Mobility programs are currently being implemented in acute care medical/surgical and intensive care settings. Healthcare leaders are seeking the best available evidence on the design and implementation of ambulation/mobility programs and their related cost savings and effect on patient outcomes. In March 2014, an electronic database search was conducted for the clinical question of “What is the evidence for patient outcomes and cost savings for nurse-led ambulation programs and mobility programs within the acute care hospitalized environment?”

Assessment - Key Summary of the Evidence: The mobility and ambulation programs examined included canine-assisted ambulation, exercise training, step activity, multimodal rehabilitation programs, early ambulation, and early mobilization. (See full Evidence Review, Pages 3 to 15). The majority of the evidence was focused in the intensive care unit (ICU), particularly for the elderly patient. One author stated there is no critical care specific research data to guide mobility therapy decisions. The literature revealed little information, definitions, or descriptions regarding cost savings related to early mobilization. A performance improvement article delineated costs associated with the education, implementation, and evaluation of a mobility program.

Outcomes Results:
- Although there is conflicting evidence regarding the outcomes of shorter total LOS and ventilator days, numerous publications demonstrate benefits to early exercise therapies and ambulation/mobility programs, such as:
  - Increased function, improved exercise capacity and activities of daily living, improved lipid profiles, positive weight changes, reduced thrombosis development, improved cardiac morbidity/mortality, improved recovery from community acquired pneumonia, enhanced surgical recovery, reduced postoperative symptoms, reduced depression in cardiac patients, and lower hospitalization costs (financial details not given).
  - Average ventilator days, average ICU LOS, and average hospital LOS significantly decreased following the adoption of either a nurse-driven early mobility protocol, one nurse-initiated 20-minute exercise session/day for two or more days, or the implementation of a nurse-led multidisciplinary mobility program.
  - Patients who participated in a canine-assisted ambulation program increased their walking distances by 96%.
  - Active/passive range of motion (ROM) in bed and chair sitting/standing are amongst the most common exercises for intubated adults, although no studies have specifically determined the benefits of passive ROM in critical care patients.
  - A step tracking device demonstrated a decline in steps from first to last 24 hours of hospitalization was associated a more than 4 times greater mortality risk (2 years post hospital discharge).

Cost Results:
- Heart failure is the most costly diagnosis for elderly persons, equal to $39.2 billion annually, with 70% of the annual expenditures related to the costs of hospitalized treatment and care.
- For patients on bed rest who must be turned, more than 4 hours (264 minutes) per patient is required (each turn = 11 minutes + 2 caregivers).
- Cost of treatment for stage III or IV pressure ulcer ($43,180) minus cost of mobility protocol nurse technician ($14,040) = cost savings of $29,140.

Assessment - Conclusions: Low mobility and bed rest are common in hospitalized older patients and are important predictors of adverse outcomes. Data supporting the benefits of ambulation/mobility programs remain difficult to capture and are only implied by the evidence for chronic conditions such as heart failure, stroke, orthopedics, and COPD. It is difficult to reduce mobility outcomes to a financial cost-benefit for the outcomes of decreased delirium, patient falls, restraint use, deconditioning, rehabilitation requirements, and work-related staff injuries associated with patient mobilization. There is a lack of evidence regarding the “dose” of mobility to be delivered, as clinicians remain uncertain of the adequate intensity and frequency of mobile activities and its intended effect on targeted healthcare outcomes. However, the evidence does suggest that the greatest impact of early mobilization and ambulation can be achieved through standardized mobility protocols and/or programs.
Outcomes Results:

- Early exercise is a safe and feasible mobility program for hospital inpatients.3;4;10
- The use of a nurse-initiated mobility protocol promoted earlier initiation and increased progression of exercise, avoiding inactivity and long periods of uninterrupted bed rest in intubated adults11
- A nurse-initiated low intensity exercise program (40% maximal intensity) may offer the most benefits to functional outcomes for COPD patients experiencing an exacerbation.10
- Adding canine-assisted ambulation to early ambulation programs for heart failure patients has the potential to decrease hospital LOS and related healthcare costs.1
- Data indicate that step tracking may be an independent predictor of health outcomes.8
  - Accelerometers could potentially quantify mobility, change in mobility, and predict health outcomes relevant to older hospitalized adults.5

Cost Results:

- Anticipated cost avoidance related to HAPU, ICU LOS, and hospital LOS were not demonstrated.6
- Budgeted nursing time during mobility protocol implementation was inadequate (18 hours of nursing care each day).6
- Mobility Protocol Education Costs (2013 US Dollars; Ann Arbor, MI):6
  - RN: $1400.00 (RN wage $30/hour x 90 RNs for 0.5 hour)6
  - Nursing Tech: $78.00 (nursing tech wage $13/hour x 12 techs for 0.5 hour)6
- Mobility Protocol Nursing Tech Costs (2013 US Dollars; Ann Arbor, MI):6
  - Total nursing tech staffing increased over 3 months = 304 hours per month vs. projected 300 hours per month.6
  - Total cost of nursing tech staff = $11,856.006
- Cost Barriers:7
  - Few data, particularly any morbidity or mortality data, support the use of mobility aids such as specialty chairs, tilt tables, walkers, and portable ventilators for ICU mobility programs.7

Recommendations: The following concluding recommendations are offered for healthcare leaders seeking to design and implement ambulation and mobility programs in medical/surgical and critical care settings:

Early mobilization, especially early ambulation, is one nursing-amendable intervention that may improve outcomes across many patient populations and settings.5;9;11 Nurse-initiated mobility programs and protocols could trigger the early initiation of movement and progressive ambulation/mobility needed to counteract the deconditioning effects of patient inactivity and bedrest.5;9;11 It is clear that early ambulation/mobility programs encompass more than simply moving a patient out of bed.5 Mobilization of patients requires communication, cooperation, and daily planning across interprofessional teams.2;5 Mobility may also be impacted by the amount of time nurses require to document ambulation and mobility, which may continue to rise.7 Step tracking devices and canine-assisted walking programs demonstrate two new innovative approaches that could increase the distance walked by patients. Therefore, healthcare leaders must carefully consider the financial aspects of ambulation/mobility programs, including the selection of program components, education/training, equipment, and the documentation requirements needed to achieve the desired patient outcomes.6;11 All of these considerations are needed to address a central concept: that the human body was meant to move, was meant to be upright and walk, and was meant to Thrive.

Respectfully Submitted

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Evidence Review for Ambulation/Mobility Outcomes and Cost

**Evidence Search Strategies:** An evidence review on the selected clinical topic was conducted in March 2014 to determine the quantity and consistency of the evidence. This review examined evidence for patient outcomes and cost savings for nurse-led ambulation programs and mobility programs in the acute care environment. An electronic database search was conducted via PubMed (open year) and CINAHL (2003 to 2014) using the search terms of “ambulation programs,” “mobility programs,” “walking programs,” “hospital,” “walk,” “cost,” and “outcome,” either alone, mixed, or in combination. Outpatient, community, home, and rehabilitation-based programs were not included. There was difficulty isolating the key term “ambulation” from the key term “mobility,” as exercise and mobility programs often included an ambulation component. This review yielded 18 relevant hits with 3 duplicates. Fifteen articles were selected for inclusion. Six additional articles were located via reference/context links, for a total of 21 articles. After careful examination, 10 articles were eliminated as they did not pertain to the clinical topic, were physical therapy focused, and/or lacked sufficient detail concerning patient outcomes and costs related to ambulation and mobility. The remaining 11 articles pertained to the clinical topic of inquiry and were included in the final review. The articles were ranked using the CCIRES Evidence Leveling System (See Page 20) and included a literature review, an integrative review, three performance improvement programs, four prospective studies, and two small randomized control trials. Result limitations include the inability to separate ambulation from the general topic of mobility, considerable variations in evidence methodology, small sample size, and few detailed definitions or descriptions for cost savings.

1. **Abate, Zucconi, & Boxer, 2011). Impact of canine-assisted ambulation on hospitalized chronic heart failure patients' ambulation outcomes and satisfaction: A pilot study.**
   a. Synergistically combine ambulation and animal-assisted therapy by using canine-assisted ambulation (CAA) to improve the ambulation outcomes of heart failure (HF) patients.
   i. Prospective study at a 267-bed acute care facility in rural Southern New Jersey.
   ii. Subjects: 69 hospitalized patients with a primary diagnosis of HF were given the opportunity to participate in CAA (walking with a therapy dog).
   b. Methods:
      i. Initial refusal rate was compared to a historical population of 537 HF patients.
      ii. Distance ambulated was recorded using a pedometer and compared with a randomly selected, 64-patient sample from the historical HF patient population, stratified by day of hospital stay.
      iii. Patient satisfaction was assessed through a 5-item Likert scale survey.
   c. Results:
      i. Refusal rates:
         1. 537-patient historical HF population had an ambulation refusal rate of 28%.
         2. When offered the chance to participate in CAA, only 7.2% of the study population refused ambulation (P = .0002).
         3. Of the 69-patient study sample, 13 initially refused ambulation then agreed when offered CAA (P = .0009).
      ii. Distance Ambulated (See Figure next page):
         1. Increased from 120.2 steps in a randomly selected, stratified historical sample to 235.07 in the CAA study sample (P < .0001).
         2. Patient who participated in CAA walked nearly twice as far (96% increase) as patients in historical group.
         3. Patient who participated in CAA walked 104% to 157% farther on days 2, 3, 5, and 6.
      iii. Length of Stay:
         1. Mean LOS for experimental group = 6.0 (SD 4.44) days
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2. Mean LOS for historical group = 7.0 (SD 4.34) days
   a. Although loss of 1 day not statistically significant, it is clinically significant
   b. Has potential to produce substantial cost savings (average $6540.020 per Agency for Healthcare Research and Quality).

iv. Patient Satisfaction (Survey):
   1. Unanimously agreed that they enjoyed and would participate in CAA again.

d. Limitations:
   i. Varying lengths of hospital stay affected the sample size
      1. When total sample size was stratified into smaller subgroups, power was lost for statistical analysis
   ii. Comorbidities were not controlled in experimental and historical populations.
      1. Overall health state of study sample population varied, possibly limiting their baseline abilities to ambulate.

e. Conclusion:
   i. Canine-assisted ambulation is a safe and effective adjunct to an early ambulation program for HF patients.
   ii. Canine-assisted ambulation may decrease hospital length of stay (LOS) and thereby decrease the costs of HF care.
   iii. Additional research involving CAA’s application to other disease processes in various settings is warranted.

   a. Investigate whether a daily exercise session, using a bedside cycle ergometer, is a safe and effective intervention in preventing or attenuating the decrease in functional exercise capacity, functional status, and quadriceps force that is associated with prolonged ICU stay.
      i. Randomized controlled trial at a Medical and surgical intensive care unit at University Hospital Gasthuisberg, Belgium
         1. Ninety critically ill patients were included as soon as cardiorespiratory condition allowed bedside cycling exercise (day 5), given an expected prolonged intensive care unit stay of at least 7 more days.
         2. Control = 32 (complete data) vs. Treatment = 26 (complete data)
   b. Measurements: All outcome data are reflective for survivors.
      i. Quadriceps force and functional status assessed at ICU/hospital discharge.
      ii. Six-minute walking distance measured at hospital discharge.
   c. Results:
      i. No adverse events identified during and immediately after the exercise training.
      ii. ICU Discharge: Quadriceps force and functional status were not different between groups; both groups were unable to stand up or walk independently.
      iii. Hospital Discharge: 6-min walking distance, isometric quadriceps force, and feeling of functional well-being (“Physical Functioning” item of Short Form 36 Health Survey questionnaire) significantly higher in treatment group ($p < .05$).
   d. Limitations:
      i. Small sample size: Study not powered to show a statistically significant difference for independent walking.
      ii. Although authors state that this study was adequately powered, final results show that this study was unable to achieve power for either group with complete data or for treatment group for incomplete data.
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1. Sample size of 36 patients in each group to achieve statistical power of 80% and a level of 0.05.
2. Authors state that significant results for some outcomes were achieved despite sample size and power issues.

e. Conclusions:
   ii. Early exercise training in critically ill ICU patients did not affect quadriceps muscle function and functional status at ICU discharge.
   iii. Proportion of patients walking independently at hospital discharge tended to be in the training group (73% vs. 55%) (but did not reach statistical significance).


   a. A prospective cohort study of 498 hospitalized medical patients, aged 70 and older in an 800-bed university teaching hospital that sought to:
      i. Estimate prevalence of different levels of mobility in a hospitalized older cohort.
      ii. Measure degree/rate of adverse outcomes associated with different mobility levels.
      iii. Examine physician activity orders and documented reasons for bedrest in the lowest mobility group.

   b. Measurements: Using average mobility level scored from 0 to 12, mobility groups defined as:
      i. Low-mobility group = a score of 4 or less
      ii. Intermediate mobility group = a score of higher than 4 to 8
      iii. High mobility group = a score higher than 8

   c. Outcomes: Functional decline, new institutionalization, death, and death or new institutionalization.

   d. Results:
      i. Low and intermediate mobility levels were common, accounting for 80 (16%) and 157 (32%) of patients.
      ii. Overall, any ADL decline occurred in 29%, new institutionalization in 13%, death in 7%, and death or new institutionalization in 22% of patients (See Figure 1 & Table 2).
      iii. When compared with high mobility group, the low and intermediate groups were associated with the adverse outcomes in a graded fashion, even after controlling for multiple confounders.
      iv. Bedrest was ordered at some point during hospitalization in 165 (33%) patients.
      v. For most patients, mobility was limited involuntarily (bedrest orders)
         1. Almost 60% of bedrest episodes in the lowest mobility group had no documented medical indication

   e. Conclusions:
      i. Low mobility and bedrest are common in hospitalized older patients and are important predictors of adverse outcomes.
      ii. Adverse outcomes associated with low mobility and bedrest may be viewed as adverse events leading to complications, such as functional decline.
   a. Evidence-based quality improvement project involving the implementation and evaluation of an early mobility program (including ventilator patients) in a 20-bed critical care medicine unit (CCMU) to migrate poor physical patient outcomes.
      i. Key stakeholders: Nursing, medicine, physical therapy (PT), occupational therapy (OT), respiratory therapy (RT), APACHE data team, nurse researcher
      ii. Consultation, referrals, and clinical guidelines for mobility, sedation, and delirium developed
         1. ABCDE approach: awakening + breathing combination; delirium assessment; pain assessment; early exercise plan
      iii. Mobility exclusion and contraindication criteria developed
      iv. (Note: Actual components of the mobility program outlining specific activities of progressive mobility were not well described in this article.)
   b. Clinical Outcomes (first 6 months of program):

<table>
<thead>
<tr>
<th>Vented Patients Outcomes: PrePilot to Current Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>(both pre-pilot and pilot groups showed no significant differences in age, gender, AP3 scores)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Prepilot</th>
<th>Program Initiation</th>
<th>Education to Enhance Mobility</th>
<th>ABCDE Program Initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Vent days/patient</td>
<td>8.07</td>
<td>6.40</td>
<td>5.94</td>
<td>5.06</td>
</tr>
<tr>
<td>Average ICU LOS</td>
<td>8.55</td>
<td>6.54</td>
<td>5.90</td>
<td>5.60</td>
</tr>
<tr>
<td>Average Hospital LOS</td>
<td>23.71</td>
<td>16.82</td>
<td>17.56</td>
<td>16.64</td>
</tr>
</tbody>
</table>

c. Project Limitations:
   i. Quality improvement project, not a research study.
   ii. Moderate care unit opened during program implementation rollout, which may have influenced the reduction in the ICU LOS and mechanical ventilator days.
   iii. Did not control for patients transferred to the moderate care unit.
      1. Small subset of patients might have gone home regardless of the mobility program.

5. (Knoblauch, Bettis, Lundy, & Medrum, 2013). Financial implication of starting a mobility protocol in a surgical intensive care unit.
   a. Implementation of a mobility protocol in a SICU, along with a literature review of the financial impact of such a protocol (US Dollars; Ann Arbor, MI).
   b. Literature review:
      i. Absence of any formal or informal studies to support the financial cost associated with early mobilization interventions.
      ii. Literature did provide data that could be used by analogy to identify workload and project potential cost savings.
         1. Turning: For a patient on bed rest that must be turned every 2 hours, more than 4 hours (264 minutes) per patients is required to change position from side to side (each turn = 11 minutes + 2 caregivers).
         2. Hospital Acquired Pressure Ulcers (HAPU): Centers for Medicare & Medicaid Services (CMS) 2007 reported stage III or IV PU identified as secondary diagnoses at a cost per case of $43,180.00
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a. Cost of treatment for stage III or IV pressure ulcer ($43,180) minus cost of mobility protocol nurse tech ($14,040) = cost savings of $29,140.

3. Other outcomes that cannot be reduced to a financial cost-benefit include decreased:
   a. Delirium
   b. Patient falls
   c. Restraint use
   d. Deconditioning
   e. Rehabilitation requirements
   f. Work-related staff injuries (employer cost and workplace safety)

c. Conclusions: Data Results of SICU Mobility Protocol: (3-month time period)
   i. Anticipated cost avoidance related to HAPU, ICU length of stay (LOS), and hospital LOS were not demonstrated
      1. Not possible to determine whether the large influx of highly acute ARDS patients (due to actual/suspected H1N1) during early 2011 impacted the outcomes
         a. HAPU incidence increased 13% after protocol implemented; increase appears to correlate with SICU patient acuity and increase LOS
      2. Budgeted amount of nursing time was found to be inadequate: 18 hours of nursing care each day.
      3. There was a lack of evidence to guide the “dose” of mobility that should be delivered; is there an adequate/intensity of mobility that could have the intended impact?
         a. Extremely ill patients may have limited ability to reach high phases in mobility protocol
         b. Evaluation did not control for severity of ill or amount of mobility patients received
   ii. Education Costs:
      1. RN: $1400.00 (RN wage $30/hour x 90 RNs for 0.5 hour)
      2. Nursing Tech: $78.00 (nursing tech wage $13/hour x 12 techs for 0.5 hour)
      3. Medical staff: Completed by clinical nurse specialist as new residents rotated into unit
      4. Respiratory Therapist: Completed by respiratory clinical specialist
      5. Family/significant other: Completed by bedside nurse with educational pamphlets
   iii. Specialty trained mobility protocol nursing tech hired to implement the protocol
      1. Total increased in nursing tech staffing over 3 months = 304 hours per month vs. projected 300 hours per month.
         a. Total cost of nursing tech staff = $11,856.00*
      2. HAPU Anticipated Cost Saving: Cost of treatment for stage III or IV pressure ulcer ($43,180) minus cost of mobility protocol nurse tech ($14,040*) = cost savings of $29,140.
         a. *Note: Different cost amounts; unable to reconcile from article.

   a. Literature review examining barriers, benefits, and other components related to mobilization of critically ill patients
      i. Benefits of mobility programs are illusive in their identification
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1. ICU data are limited regarding the role mobility exercise may play in treating the effects of acute illness and acute deconditioning.
2. Only implied by various literature in chronic disease states when exercise programs were administered.

ii. Mobility could be approached with protocolization
   1. Could be thought of in terms of quantity of dose, duration of dose, frequency of administration.

iii. Mobility of ICU patients may be impacted by the amount of time nurses require to accomplish the necessary documentation, which may continue to rise.

iv. Specific Interventions/Therapies/Mobility Decisions:
   1. Virtually no ICU data guiding current ICU mobility therapy decisions.
   2. Few if any studies that assist caregivers in defining the risks associated with mobility of critically ill patients.
   3. Comparison of a low mobility group with a high mobility group demonstrated that was a graded association with adverse outcomes
      a. Decline in activities for daily living (ADLs)
      b. New need for institutionalization (i.e. nursing home)
      c. Death
   4. No studies have specifically determined the benefits of passive ROM in ICU patients.
   5. Electrical stimulation (lower limbs for 30 minutes twice daily) significantly improved muscle strength and decreased the number of days needed to transfer from bed to chair (11 days vs. 14 days).
   6. Despite the lack of clinical trials, tilting was included as a treatment modality in the 2004 and 2006 statements by British physiotherapists working in critical care.
   7. Overall utility of kinetic therapy beds is unclear, given their expense and lack of definitive cost-benefit analyses.

b. Benefits: Besides relying on a common-sense foundation that supporting early administration of mobility therapy in ICU, numerous publications demonstrate an inpatient benefit to early exercise therapies, such as: (*Conflicting evidence)
   i. Shorter total lengths of stay*
   ii. Lower hospitalization costs
   iii. Functional assessments reaching preset endpoints sooner
   iv. Increase exercise capacity
   v. Improve lipid profiles
   vi. Weight changes
   vii. Improve autonomic function
   viii. Cardiovascular morbidity
   ix. Cardiovascular mortality
   x. Reduction in prevalence of depressive symptoms in cardiac patients
   xi. Reduced thrombosis development (early ambulation)
   xii. Better function in instrumental ADLs at 1 month

c. Cost Barriers:
   i. Passive Range of Motion (ROM): No studies reporting efficacy of passive ROM in ICU setting for high acuity patients.
      1. Difficult to justify the cost of physical therapy positions targeted to ICU considering the current lack of safety or efficacy data.
         a. Lack of data regarding either a quality improvement or overall hospital cost reduction.
ii. Mobility Aids: Specialty chairs, tilt tables, walkers, and portable ventilators for ICU mobility programs.
   1. Few data to support use of these devices, particularly any data to demonstrate improvement in morbidity or mortality.

d. **Deconditioning:**
   i. Deconditioning: Multiple changes in organ system physiology that are induced by inactivity and reversed by activity.
   ii. Acute deconditioning: Changes that occur within days to a few weeks of sudden decrease in activity.
   iii. Chronic deconditioning: Changes that occur over a period of months and years resulting from a decrease in activity.
      1. Without mobilization, antigravity muscles of calf and back lose strength.
      2. Muscle groups losing strength the most quickly are the groups involved with maintaining posture, transferring position, and ambulation.
      3. ICU patients can lose more than 1.5 kg of skeletal muscle mass per day and up to 50% of total muscle mass in 2 weeks’ time.
      4. Elderly ICU patients may experience prolonger functional difficulties because of their relative decreased premorbid muscle mass and decreased exercise tolerance at baseline.
      5. Detrimental effects have been shown on both heart tissue and peripheral cardiovascular system.
         a. Cardiovascular deconditioning reduces orthostatic tolerance.

7. **(Ostir, Berges, Kuo, Goodwin, Fisher, & Guralnik, 2013). Mobility activity and its value as a prognostic indicator of survival in hospitalized older adults.**
   a. A prospective study of 224 adults in a 20-bed Acute Care for Elders (ACE) hospital unit at University of Texas Medical Branch teaching hospital from March 2008 to October 2009.
      i. Assess total steps and minutes active in the first and last 24 hours of hospitalization and examine associations with survival after discharge in hospitalized older adults.
   b. **Methods/Instrumentation:**
      i. Activity monitor used to collect information on total steps and minutes of activity in the first and last 24 hours of hospitalization.
         1. StepWatch Activity Monitor (SAM, Cyma Corporation, Seattle, WA):
            Waterproof dual-axis accelerometer that attaches to the ankle with a strap.
         2. Placed on the participant at time of consent and worn until discharge.
         3. Assess ambulatory activity (total steps and minutes active).
            a. SAM provides no direct feedback to the person.
         4. 98% accurate in a variety of clinical populations, including those with slow or shuffling gait, and will not record leg movements while person is lying in bed.
         5. Steps recorded in 1-minute intervals synchronized to a 24-hour clock, resulting in temporal series of 1,440 observations (minutes) per 24 hours.
         6. Total steps calculated in first and last 24 hours of hospitalization for each participant and used as a continuous and categorical measure.
         7. Activity calculated as number of 1-minute intervals recorded in a 24-hour period with a step count >0.
      ii. The main outcome was 2-year survival from hospital discharge date.
   c. **Results:**
      i. Participants were active for approximately 80 minutes in the first 24 hours.
      ii. Participants aged 65–84 were active approximately 28 minutes more in the last 24 hours of hospitalization.
iii. Activity levels were essentially unchanged for those aged 85 and older.
iv. Median step count for participants was low, with a median of 478 steps in the first 24 hours of hospitalization and 846 in the last 24 hours.
v. Multivariate survival models showed that, in first and last 24 hours of hospitalization, each 100-step increase was associated with a
   1. 2% (hazard ratio (HR) = 0.98, 95% confidence interval (CI) = 0.96–1.00) to
   3% (HR = 0.97, 95% CI = 0.94–0.99) lower risk of death over 2 years.
vi. Decline in steps from first to last 24 hours of hospitalization associated with >4 times greater risk of death (HR = 4.21, 95% CI = 1.65–10.77) 2 years after discharge.

b. Limitations:
   i. Study set in a single ACE hospital unit; results may not be generalizable to other settings.
   ii. Individuals with cognitive difficulties were excluded.
   iii. Although the device provided no direct feedback, wearing the device may have encouraged individuals to walk more than otherwise would have occurred (despite the low step count results).

c. Conclusion:
   i. Data from current study indicate that step activity may be an independent predictor of health outcomes.
      1. Accelerometers have the potential to quantify mobility and change in mobility and to predict health outcomes highly relevant to older adults.

   a. To determine whether an early rehabilitation program was safe and feasible for patients during an acute exacerbation of chronic obstructive pulmonary disease (COPD).
      i. Inpatients (N=32) with an acute exacerbation of COPD randomly allocated to a low-intensity exercise group (40% maximum intensity) (n=11), a moderate- to high intensity exercise group (70% maximum intensity) (n=10), or a control group (n=11), who received routine physical therapy.
      ii. In addition to routine physical therapy, patients in the exercise group participated in an exercise program of twice-daily aerobic and resistance exercise sessions.
         1. Primary outcomes: Number and classification of adverse events and program adherence.
         2. Secondary outcomes: Evaluate exercise tolerance, muscle strength, lung function, activity status, hospital LOS.
            a. 3-minute walk test
            b. Chest press/knee extension measured with muscle tester
            c. Muscle strength of upper/lower limbs
            d. Forced expiratory volume (spirometry)
            e. Barthel index
   b. Adverse Events (for 174 exercise sessions)
      i. 1 serious adverse event of arrhythmia (atrial fibrillation) in low-intensity exercise group that resolved within 1 hour.
      ii. 12 other minor adverse events involving 5 patients with no significant differences between groups.
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c. Results:
   i. It may be safe and feasible to implement an early rehabilitation exercise program for inpatients during an acute exacerbation of COPD.
   ii. Patients completed an average of 80% of their scheduled sessions with no significant between-group differences.
   iii. Both exercise groups significantly improved in 3-minute walk test distance following the intervention prior to discharge (significant within group differences).
   iv. Participation in the exercise program did not result in an increased LOS when compared to control group.
      1. Did not negatively affect recovery rate from acute exacerbation of COPD.
   v. There were significant within group differences in lung function within the low-intensity exercise and control groups.
   vi. Small effect sizes in 3-minute walk test and upper limb strength, favoring the low-intensity exercise group over the control group, which prevented deterioration in quadriceps strength during hospitalization.
   vii. Small to medium effect sizes were also found in upper limb strength, lung function, 3-minute walk test distance, Barthel index, and length of stay, favoring the low-intensity program over moderate- to high-intensity program.

d. Limitations:
   i. Small sample size; could not fully evaluate the effects of any rare adverse events.
   ii. Brief timeframe did not allow evaluation of long term benefits of exercise program.

e. Conclusions:
   i. A low intensity exercise program (40% maximal intensity) may offer the most benefits to functional outcomes.
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Evidence Sourced from Ambulation/Mobility Best Practices Literature Review (September 2013)

   a. Performance improvement project involving 13 ICUs in eight hospitals within the US implementing a user-friendly, physiologically grounded evidence-based mobility program.
   b. Program Design:
      i. Progressive Mobility Tool
      ii. Face to Face Workshop
      iii. Target Messaging
      iv. Continuing education
      v. Cultural interventions to support integrative of practice behaviors
      vi. Process + outcomes measurement
   c. Patient Outcomes:
      i. Ventilator days
      ii. Timing of PT consultation
      iii. Retrospective chart abstraction and concurrent direct observational data
   d. Results:
      i. No significant differences demonstrated in any group measurement.
      ii. Prone positioning and CLRT metrics demonstrated no substantial impact due to inconsistent or lack of use.
      iii. Reduction in ventilator days (3.0 days pre vs. 2.1 days post) approached significance ($p = 0.06$).
      iv. 57% compliance for obtaining PT valuation within the first 24 hr in ICU regardless of intubation status.
   e. Limitations:
      i. Performance improvement project, not a research study.
      ii. Cannot diminish the likelihood of self-selection contributing to the success many teams experienced in patient mobility.
      iii. Data collected by hospital staff after initial instruction and direction; no additional training or a designated data collector; may have resulted in inconsistent or inaccurate data.
      iv. Site aggregation limited the ability to statistically analyze patient process data and outcome indicators which could have resulted in different statistical significance
      v. Survey data was not statistically analyzed.

     a. Integrative review of the impact of an early mobilization protocol on the med/surg inpatient population.
        i. Search Strategy & Results:
           1. Electronic Database on Ovid, MEDLINE, and PubMed. Key terms: ambulation, postoperative care, length of stay
           2. 9 empirical studies met inclusion criteria between years 2000 to 2111
           3. 4 studies with surgical populations
              a. 5 studies with patients with medical diagnoses
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b. Early Mobilization Definition: Movement out of bed with change from horizontal to upright position for at least 20 minutes during first 24 hours of hospitalization, with progressive mobilization on each subsequent day during hospitalization.

c. Results:
   i. Early mobilization (especially early ambulation) was associated with improved outcomes for patients with:
      1. Deep vein thrombosis (DVT)
      2. Community acquired pneumonia (CAP)
         a. Maintain functional well-being
      3. Older adults
      4. Patients recovering from surgery
   ii. Adoption of a nurse-driven mobility protocol based on early mobilization led to decreased LOS for hospitalized elderly patients and maintained/improved their functional status from admission to discharge.
   iii. A more standardized early mobilization protocol can significantly:
      1. Improve the functional status of hospitalized older adults
      2. Reduce LOS for patients with CAP
      3. Reduce LOS for patient who underwent lower limb amputations
   iv. For surgical patients (laparoscopic sigmoidectomy, laparoscopic colorectal or colon surgery, and major colon surgery), only the basic tenets of an early mobilization protocol were included in the structure of a larger rehabilitation program.
      1. Surgical patients in these programs experienced reduced LOS, faster recovery time, and reduced postoperative symptoms.

d. Conclusions:
   i. The greatest impact of early mobilization is through standardized mobility protocols or programs.
   ii. Early mobilization is one nursing-amenable intervention that has previously shown to provide positive outcomes for critical care, cardiovascular, neurological (stroke), and orthopedic patient populations.
   iii. Early mobilization (especially early ambulation) of medical/surgical inpatients may improve patient outcomes.
   iv. Early mobilization alone or in combination with other rehabilitative strategies can reduce LOS and prevent complications associated with functional decline.
   v. Multimodal rehabilitation programs can contribute to positive outcomes for patients recovering from surgery.

1. Limitations:
   i. Integrative review of the evidence; not research.
   ii. Researchers defined and implemented early mobilization protocols in a slightly different manner in each study.
   iii. Although overall definition of early mobilization was the similar, the implementation method could impact clinical outcomes.

   a. Research study to compare standard care with care delivered using a mobility protocol to examine the effects of exercise on vital signs, inflammatory biomarkers, and effects of nurse-initiated mobility protocol on patient outcomes.
      i. Prospective, repeated measures study with a control period (standard care), run-in period, and intervention (protocol) period.
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ii. Sample: 75 Medical ICU and Surgical ICU adult patients at a large, urban, academic medical center in Cleveland, OH during December 2007 through March 2009.
   1. Control = 20 vs. Experimental = 55

iii. Mobility Protocol: One 20-minute episode of exercise daily for 2 to 7 days initiated by a nurse.
   1. Control: Exercise started on day of enrollment.
      a. First activity started on average at day 9.

iv. Variables:
   1. Dependent:
      a. Biomarkers pre-and post exercise on Days 1-3, 7, 14
      b. Delirium
      c. VAP
      d. VTE
      e. HAPU
      f. Muscle strength
      g. Days of mechanical ventilation
      h. ICU LOS
      i. Discharge location after ICU
   2. Independent
      a. Standard of care
      b. Mobility protocol

b. Results:
   i. Significantly more women and higher APACHE 3 scores for patients during study.
   ii. Most common exercises
      1. Active/passive ROM in bed: 21% of subjects within 3 days of enrollment.
      2. Chair sitting/standing: 25% (Intervention n=14) vs. 10% (Control n=2).
   iii. Daily exercise not statistically associated with vital signs changes or unsafe events
   iv. Relatively limited intervention of one 20-minute episode of exercise daily for two or more days initiated by a nurse can demonstrate a significant reduction in ICU LOS.
   v. Exercise duration linked to increased IL-10, suggesting brief episodes of low-intensity exercise positively altered inflammatory dysregulation.
   vi. High levels of IL-6 not associated with mortality
      1. Low mortality was attributed to selection criteria of physiologic stability for enrollment.
   vii. Neither inflammatory cascade molecule was associated with muscle strength at ICU discharge.
      1. 21% unable to participate in manual muscle testing.
   viii. Mobility exercises or combination of exercises and limited sedation may contribute to reduced delirium.
      1. Delirium not assessed as part of daily ICU practice; unable to comment as to whether delirium progression or resolution was result of exercise.

c. Conclusions:
   i. Use of a nurse-initiated mobility protocol promoted both earlier initiation and increased progression of exercise, avoiding clinician inertia and long periods of uninterrupted bed rest in intubated adults.
   ii. Exercise in relatively stable, intubated adults in ICU is safe.
   iii. Exercise does not appear to contribute to a pro-inflammatory milieu in serum.
   iv. Protocol use promoted early/progressive exercise associated with decreased LOS.
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Reference List 


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Electronic Database Search Methodology

Date(s): March 5th and 6th, 2014

Literature search topic/clinical question: What is the evidence for patient outcomes and cost savings for nurse-led ambulation programs and mobility programs within the acute care hospitalized environment?

Inclusion Criteria: Ambulation and/or mobility programs; acute care; hospitalized adults; medical/surgical units; critical care units

Exclusion Criteria: Programs other than ambulation/mobility; non-acute care environment; adult patients not on Medical/Surgical Units or Critical Care Units; pediatrics; spinal cord injury; trauma; burns

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<th>Total References Identified (hits)</th>
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<th>No. of Total Duplicate Articles</th>
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#Controlled vocabulary (subject terms, MESH terms, tagged terms specific to database)

*Use the first database as the main comparison for subsequent database searches and identifying duplicate articles
## Patient Outcomes and Cost Savings for Ambulation and Mobility Programs: A Summary of the Evidence

**April 2014**

### Database Selection and Search Criteria

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| **Name:** PubMed  
**Years:** Open | Ambulation program AND walk AND outcomes AND hospital NOT outpatient NOT home NOT community | 69 | 5 | 0 | 5 | 3 | 2 |
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**TOTALS** | 263 | 18 | 4 | 14 | 8 | 6 |

#Controlled vocabulary (subject terms, MESH terms, tagged terms specific to database)

*Use the first database as the main comparison for subsequent database searches and identifying duplicate articles

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## Patient Outcomes and Cost Savings for Ambulation and Mobility Programs: A Summary of the Evidence

### April 2014

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<table>
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<th>*Reference/Contextual Links</th>
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<tr>
<td>Citation: Cortes, Villar, Devereaus, &amp; DiCenso (2009). Early mobilisation for patients following acute myocardiac infection: A systematic review and meta-analysis of experimental studies. <em>International Journal of Nursing Studies, 46</em>(11), 1496-1504.</td>
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### *Ambulation/Mobility Best Practices Literature Review*


### Total Articles Included in Literature Review: Database (6) + Contextual Links (2) + Previous Review (3) = 11

*Additional articles/information found in references lists and/or article review

### Search Notes:

Exact search strings were unable to be used between databases. Some databases were unable to support the complex nature of search term combinations. Simpler and more open search terms and combinations were used an effort to capture the requested literature.

### Key Terms:

Mobility program*, ambulation program*, walking program, cost, outcomes, hospital, and walk, in multiple combinations.

### Key Terms Notes:

There was difficulty isolating the key term “ambulation” from the key term of “mobility”, as mobility protocols and programs include ambulation and other types of progressive/early mobility activities. “Ambulation programs” did not return any hits, while “mobility programs” did generate hits.
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**Collaborative Center for Integrative Reviews and Evidence Summaries**

**CCIRES© Evidence Leveling System (ELS)**

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<th>DESCRIPTION</th>
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<th>ARTICLE NUMBER</th>
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<tr>
<td>B</td>
<td>Well-designed controlled studies, both randomized and nonrandomized, prospective or retrospective studies, and integrative reviews with results that consistently support a specific action, intervention, or treatment</td>
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<tr>
<td>C</td>
<td>Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results</td>
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<tr>
<td>D</td>
<td>Peer-reviewed professional organizational standards, with clinical studies to support recommendations</td>
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<tr>
<td>E</td>
<td>Theory-based evidence from expert opinion or multiple case reports, case studies, consensus of experts, and literature reviews</td>
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* A large sample has adequate power to detect the observed effect with confidence (as seen in significant Confidence Intervals). A small sample may lack confidence in the power of the desired effect (Polit & Beck, 2008)

Designed by Emma M. Cuenca and Cecelia L. Crawford, Collaborative Center for Integrative Reviews and Evidence Summaries (CCIRES); ©Kaiser Permanente SCAL Regional Nursing Research Program, May 2011  
*Adapted from AACN Evidence Leveling System (2009) and Canadian Medical Association & Centre for Evidence-Based Medicine, Levels of the Evidence (2001)*
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