Table 2, Chapter 21. Multi-component pressure ulcer prevention initiatives conducted in long-term care settings in the United States

| **Author/Year** | **Descriptionof PSP** | **Study Design** | **Theory or Logic Model** | **Description of Organization** | **Contexts** | **Implementation Details** | **Outcomes: Benefits** | **Influence of Contexts on Outcomes** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Horn et al. 201017 | Real-Time Program (renamed On‑Time Quality Improvement for Long Term Care [On-Time])Target safety problem: PUKey elements: CNA assist in redesigning documentation to include core data elements to help identify high-risk patients; facilitators provide feedback on weekly clinical decision-making reports; staff educated on QI methods and smooth integration of these CNA documentation and clinical reports into day-to-day flow | Time series  | Based on best practices from AHRQ and AMDA guidelines, and findings from the National Pressure Ulcer Long-term Care Study (NPULS) | 11 not-for-profit facilities in 7 statesBed size:44–432 beds1–3 highest-risk units per facility participated | External: AHRQ fundedOrganizational Characteristics: NSTeamwork, Leadership,Culture: NSImplementation tools: * CNA documentation processes and timely reports to identify patients at risk
* A project leader (e.g., DON) and ongoing team identified
* Educate staff on QI methods and use of documentation forms and reports
 | Length: 9 monthsProcess:Facilitators work with a multidisciplinary team from each facility. Redesigned CNA documentation incorporating “core data elements” including nutrition and incontinence variables. CNA’s coached to improve documentation. Sites fax scannable forms to project office. Clinical reports returned within 24 hours and displayed. Feedback includes inconsistencies and completeness of CNA documentation per unit/unit over time/shift. After reviewing with CNAs, need for additional education noted.Conference calls (bi-weekly), all-facility meetings (every 6 months) and on-site meetings were scheduled with facilitators, project leaders and frontline staff. Successes:CNA’s widely accept revised forms and increase productivity.Documentation completeness rates increase from80%–90% to mid‑90%. Barriers: EMR system used by 1 facility could only export data elements and create 1 report Issues raised with preparing the CNA documentation * forms needing the resident’s study ID number and
* faxing forms for report generation

Staff turnover especially by DON slowed project momentum.Addressing Barriers:* Add new CNA documentation process into orientation programs
* Phase in use of documentation.
* Develop a strong multidisciplinary team to lead improvement efforts and not rely on one project leader.

Sustainability:“HIT needed to capture CNA documentation and generate reports.”“Managing the manual data collection, faxing forms to the project office and creating clinical reports for distribution back to the facilities on a weekly basis could not be maintained over the long term for many facilities.”Program expanded throughout the U.S. | CMS HRPrU QM prior to implementation(k = 7): 13.0%CMS HRPrU QM 12 months after implementation(k = 7): 8.7%HRPrU QM % change(5 facilities using≥2 reports)-25% to -82.4%High Risk PrU QM% change(2 facilities using 1 report)+8.3%, +14.3%Average number of in-house acquired PU (all stages) per facility pre-implementationvs post-implementation:12.1 to 4.6(62% reduction) Average number of CNA documentation forms reduced by 53.2%. | Facility “B” which had the highest reduction in PU(-82.4%) was the only facility that:* had 100% participation of residents(n = 75)

Facility “B” was 1 of 3 facilities who incorporated all 4 clinical reports for care planning.Two facilities with the lowest reduction in PUs did not involve a multidisciplinary team. |
| Rantz et al. 201018 | Bedside EMR (OEMR, Irvine, CA) and statewide on-site clinical consultation services(QIPMO – Quality Improvement Program for Missouri)Target safety problem: ComprehensiveKey elements:Mandatory OEMR training, QIPMO nurses  | RCT 4-group comparisonGroup 1:EMR plus consultGroup 2: EMRGroup 3:ConsultGroup 4: Control | NS | 18 facilities in 3 U.S. statesGroup 1: 4 facilitiesBed size range,98–240,total 668Group 2:4 facilitiesBed size range, 105–218, total 635Group 3:5 facilitiesBed size range,90–123,total 543Group 4:5 facilitiesBed size range, 120–310,total 890Group 1, 3, 4 from MissouriGroup 2: Other States | External: CMS funds OEMR hardware, software and ongoing tech supportOrganizational Characteristics:Mix of for-profit,not-for-profit, and governmental facilitiesTeamwork, Leadership, Culture:NSImplementation tools:* Project coordinator assigned at intervention facility
* QIPMO nurses
 | Length: 2 yearsProcess:* Project coordinator works with OEMR staff
* Staff works with QIPMO nurses at least monthly
* QIPMO nurses encourage staff to focus on clinical care and improving care systems to be enabled by OEMR

Successes:Group 1, 2 and 3 showed improvements at12 months;Group 1 and 2 sustained at 24 months Barriers: NSAddressing Barriers: NSSustainability:Improvement sustained during Year 2 for Group 1 and 2 | Relative improvement in high risk pressure sores (negative scores indicate improvement)12 monthsGroup 1: -53%Group 2: -12%Group 3: -5%Group 4: +435%24 months Group 1: -3%Group 2: -8%Group 3: +59%Group 4: +105% | “Total costs for the 3-year evaluation for the groups of facilities implementing technology increased $15.11 (12.5%) for Group 1 and $16.89 (9.6%) for Group 2, while those for the comparison groups did not.”“Cost increases were most likely attributable to the cost of technology, maintaining and supporting the technology, and on-going staff training to use the EMR and not increase direct care staffing or turnover.”  |
| Milne et al. 200919 | LTACH care process improvementTarget safety problem: PUKey elements:Nursing association consults; team training; improve assessment and documentation methods; EMR revised; formal and informal staff education; wound care product reviews  | Time series | Failure mode and effects analysis\* | Long-term acute care facility in CTBed size, 108 | External: NSOrganizational Characteristics:Above average PU prevalenceTeamwork, Leadership, Culture:* Faulty EMR
* Inconsistent use of EMR by clinicians
* Deficient risk assessment documentation

Implementation tools:* Training by nursing association
* APN appointed in‑house leader
* APN and nursing supervisor become WCC
* Team clinicians trained in prevalence data collection
* EMR revised; PUSH tool added
* Staff educated via formal clinical rounds, interactive sessions and one-on-one bedside sessions
* Immediate feedback given on training
 | Length: 13 months facility wideProcess:* Roles for new skin team members defined
* Team meets weekly to review “failure modes” and develop new care processes
* Revamping of policies and procedures after review of CPGs
* Wound care product reviews

Successes:PU reduced to <3% on two units due to increased monitoring of modified nasal cannula (pulmonary unit) and increased attentiveness to heel offloading, support surfaces and proper positioning (SCI/trauma unit); of the 396 charts reviewed, <1% had missing data; staging and wound etiology were consistently determined by wound team in greater than 90% of cases (based on a review of 45 patient charts)Barriers:Rates climbed once strict monitoring was leveled offAddressing Barriers:Increase in unit presence, chart monitoring, feedback to staff, and biweekly prevalence rounds Sustainability:* CWCN certification of 2 team members provide in-house expertise
* Monthly review of documentation and PU prevention interventions
* Early intervention
 | Mean facility-acquired PU prevalence:* Pre: 41%
* Post: 4.2%

Pulmonary-focused unit:* Pre: 25%
* Post: <3%

SCI/trauma unit:* Pre: 33.8%
* Post: 2.9%
 | Data on PU prevention implementation in a LTACH is spare. Two LTACH units however were able to reduce PUs to <3% due to “increased diligence” by the team. The authors noted an “increased collaboration among disciplines with regard to wound prevention and treatment as well as a tendency for early intervention when wounds are newly discovered.”  |
| Tippet A. 200920 | Physician consultant leads deficient nursing home to zero facility-acquired PUs Target safety problem: PUKey elements:Physician wound consultant, multidisciplinary team, education, weekly informal feedback, wound care protocols based on AHRQ CPG, wound coordinator sustains program | Time series | Based on AHRQ CPG | Midwest skilled facilityBed size: 151 | External: G-level citation (actual harm deficiency) and state survey deficienciesOrganizational Characteristics: NSTeamwork, Leadership, Culture: NSImplementation tools:* Physician consultant
* Multi-disciplinary team
* Braden Scale, AHRQ CPG
* Incentive programs
* Informal feedback
* Simplified wound care formulary
* Equipment evaluation (Delphi process used to evaluate products)
 | Length: 6 yearsProcess:* Physician consultant educates staff and conducts yearly follow-up training (all mandatory)
* Team forms goals and meets weekly
* Select members conduct wound rounds
* Follow-up training through in services, and yearly follow-up
* Nursing supervisors conduct one-on-one with staff and weekly informal feedback
* Preventive care plans created
* Protocols discussed in classes, become part of routine shift reporting and charting
* All nursing staff made accountable for care and reporting

Successes:Goal of zero facility acquired ulcers reached after 6 monthsFacility citation free“Accolades from surveyors for wound program”Judged competitions between floors promote teamwork and buy-inBarriers: NSAddressing Barriers: NSSustainability:Wound care coordinator position established to supervise, train, provide clinical support and track wounds.Permanent decline after 6 months through study end | Average pre-initiative incidence: 5.19%Average post-initiative incidence: 0.73% (p<0.0001)4 year post-initiative incidence: 0.06%(p<0.0001) | Estimated cost savings per PU/per month:$1,617Monthly savings: $10,187Yearly savings:>$122,000 |
| Rosen et al. 200621 | Ability, Incentives, and Management feedback (AIM system)Target safety problem: PUKey elements:Staff ability enhancement (skin care training, use of penlights and TAP card), real‑time management feedback, financial incentives | Longitudinal time series study; four 12-week periods (baseline assessment, intervention, and two post-intervention periods) | NS | Not-for-profit nursing home in U.S.Bed size, 136 | External: AHRQ fundedOrganizational Characteristics:Received multiple Department of Health citations due to persistently high PU ratesTeamwork, Leadership, Culture:Lack of management to oversee earlier processesImplementation tools: * Research team contacts administrators responsible for overseeing implementation.
* Mandatory “skin care” training (a 40‑minute computer-based, interactive-video education program).
* Penlights
* Caregivers wear plastic TAP (turn and position card) to remind all hospital personnel the direction residents should be facing every 2 hours.
* Administrators receive a weekly report of staff that had completed training.
* A graphic “thermometer” of PU incidence was also updated weekly and displayed in the staff lounge.
* Each staff member received $75 if the PU incidence was below target goal (incidence <3%) set by administration.
* Staff reprimanded for non-completion.
* Staff terminated for not completing training during extension period.
 | Length: 48 weeksProcess:One skin care nurse assessed patients upon admission or notification by staff of any skin changes.During the post-intervention periods, no weekly reports were provided to the administrators, no established targets or goals were established, and there were no financial incentives offered to staff. Only 3 of 29 new hires completed training.Sustainability:The intervention was not sustained over the two post-intervention periods however Rosen et al. indicated that a highly motivated administrator could have maintained the 3 program components.  | Significant reduction in emergence of stage 1–4 PUs Pre-intervention: 28.3%Intervention:9.3% (z[I] = 2.64,p<0.001)Total ulcersStage 1 and beyondPre-intervention(n = 134): 38% (28.3)Intervention(n = 107): 10% (9.3)Post-Intervention I:19% (17.7)Post-Intervention II:19% (17.7)Total ulcersStage 2 and beyondPre-intervention:31% (23.1)Intervention: 10% (9.3)Post-Intervention I:15% (14.0)Post-Intervention II:17% (15.9) | With a mean cost of $2700 of treating a single stage II PU, [26] reducing the incidence of these ulcers by approximately 15 over 12 weeks yields a potential savings of more than $40,000 while distributing less than $10,000 as incentives. This does not take into consideration the added savings in fewer personal injury lawsuits. The primary management feedback tool was adherence to the mandated training (not emergence of a new PU). Additional real-time feedback was provided to staff in the form of a visual “thermometer” of PU occurrences each week. All a nonfinancial incentive, it served as a supplementary motivating factor as the incidence of PUs was visually perceived as declining.  |
| Abel et al. 200522 | Process of care system changes in collaboration with a state QIOTarget safety problem: PUsKey elements: Collaborative with a state QIO, intervention tool kit, nurses aid and licensed staff training  | Pre-post  | NS | 20 facilities in TexasAverage residents: 100Average Medicare beds: 15 | External: Identified from 143 Medicare-certified skilled nursing facilities as having high rates of PUs and a high volume of residents receiving preventive careOrganizational Characteristics: Selected due to accessibility to state QIO (Texas Medical Foundation [TMF])Teamwork, Leadership, Culture: NSImplementation tools:* TMF provides tools
* Nurses Station Reference Cards
* Pocket Assessment Card
* Mobility Program
* Fax Communication Form
* Care Planning Tool
* ResidentPatient and Family Education Brochure

Tool kit components based on information from the AHRQ CPGs, Rhode Island Quality Partners, and regulatory requirements (federal and state) * Nursing staff internally responsible
* TMF externally responsible
* QA committee
 | Length: 2 yearsProcess:* Monthly onsite visits by TMF
* Tools modified
* Periodic progress assessment

Successes:* Performance significantly improved on 8 of 12 QIs
* Management maintains autonomy which promoted “continued commitment and a sense of ownership”

Barriers:* Staff resistance
* “Staff turnover and variation in new staff orientation often contributed to clinical or operational practices that were inconsistent with their protocol requirements.”
* Incomplete risk assessments
* Monitoring systems not appropriately used
* Documented risk factors not acted upon

Addressing Barriers: Monthly visits by TMF and improving performance Sustainability: NS | Incidence rate: Pre: 13.6%Post: 10.0%Significant improvements in 8 QIs (baseline vs. re-measurement):* Proportion of residents with appropriate risk assessment completed within 2 days of admission(2.2% vs. 15.3%;p<0.0001)
* Proportion of high-risk residents with appropriate care plan for ALL selected triggers for high-risk residents(10.1% vs. 21.8%;p<0.0001)
* Proportion of high-risk residents whose care reflects the triggered care plan interventions (2.0% vs. 9.8%; p<0.0001)
* Proportion of residents with PUs that receive weekly skin assessments (12.6% vs. 32.8%; p<0.0001)
* Proportion of facility-acquired and community-acquired PUs with appropriate ulcer description within 24 hours of ulcer recognition (53.5% vs. 68.9%; p = 0.035)
* Proportion of residents with PUs and mobility issues using a pressure relief mattress/overlay (50.7 vs. 76.7; p<0.0001)
* Proportion of residents identified as high risk (as per MDS) using a pressure relief mattress/overlay (33.0% vs. 53.4%; p = 0.003)
* Proportion of residents whose treatment orders and care plan interventions for PUs reflect facility wound care protocol (1.3% vs. 4.9%; p = 0.0505)
 | “Although there are areas for improvement, the implementation of process of care system changes by NHs in a collaborative relationship with a QIO may yield improvements in measures of patient outcomes (e.g., PU incidence).” Abel et al. also indicated that the 10 facilities with the highest [QI] scores at re-measurement showed a trend toward a lower [PU] incidence rates than the 10 facilities with the lowest [QI] indicator scores at re-measurement(S = 125.5,p = 0.07).Facilities with the highest QI scores versus facilities with the lowest QI scores (baseline vs. re-measurement; PU incidence rate, %):High scoring group:12.3% vs. 7.7% Low scoring group:14.8% vs. 12.2% Facilities with the greatest improvement versus facilities with the least improvement in QI scores (baseline vs. re-measurement; PU incidence rate, %):High scoring group:13.1% vs. 7.1%Low scoring group:14.0% vs. 12.8% |
| Rantz et al. 200123 | Statewide implementation of Show-Me QI reportTarget safety problem: ComprehensiveKey elements:Workshops, Minimum Data Set (MDS) Quality Indicator (QI) feedback reports, clinical consultation | RCTGroup 1:Workshop plus feedback reportsGroup 2:Workshop, feedback reports and clinical consultGroup 3:Control | NS | 87 nursing homes in MissouriBed size:1–60: 1061–120: 52120+: 25 | External: NSOrganizational Characteristics:Adequate experience with transmitting MDS data electronicallyTeamwork, Leadership, Culture: NSImplementation tools:* Educational workshop
* RAI manual
* RAPs
* CPG (AHRQs)
* Comparative feedback Show-Me QI report (quarterly)
* GCNS consult
 | Length: 1 year Process:* “Core group” receives Show-Me QI report in workshop; subsequent quarterly reports sent to administrator and DON
* GCNS help interpret report, assess resident problems, and document care
* 15 facilities (Group 2) had ≥1 on-site visits and GCNS calls
* 18 facilities (Group 2) had only 1 call and limited GCNS calls
* 13 quality indicator outcome measures were evaluated

Successes:Reduction in pressure ulcers (overall and low-risk) for residents in facilities using GCNS Barriers:* Short staff
* Staff turnover especially nurse RAI coordinator
* “Taking care themselves”
* Cancelled site visit at last minute
* Additional time needed to correct inaccurate MDS assessments
* Teams “mired in the MDS assessment process and coding issues”
* Difficulty convincing staff to use continuous QI principles

Addressing Barriers:* Stronger incentives to use GCNS
* GCNS more local
* More flexible site visit times
* Extend time to implement change
* Use teams to address problems
* Post accomplish­ments
* Multiple nurses responsible for RAI process
* Use of quality manager on staff to support care delivery improvements
* Leadership buy in to QI

Sustainability: NS | Secondary regression analysis:MDS QI 29Pressure Ulcers (overall):Case mix: 0.156Time Pre-Post: 0.240Intervention: 0.026Group X Time: 0.085 (p≤0.10)MDS QI 29lrPressure ulcers low risk: Case mix: 0.417Time Pre-Post: 0.037Intervention: 0.064Group X Time: 0.057 (p≤0.10) | A subset of Group 2 nursing homes that were intensely involved with the intervention showed improvement in MDS QI scores for five outcome measures including MDS QI 29 (pressure ulcers). “Nursing homes that did have continuous quality improvement systems in place were often part of larger health care systems that have ongoing support from a quality improvement expert.” |
| Ryden et al. 200024 | Protocol implementation by APNs Target safety problem: ComprehensiveKey elements:APNs assist staff to implement care plan; APNs provide direct care to residents | Controlled before-and-afterAPN treatment (2 facilities) vs. usual care (1 facility) | Havelock’s (1974) model of effective research utilization | 3 privately-owned facilities located in suburban Minneapolis-St. Paul area; certified for Medicare  | External: NSOrganizational Characteristics:APNs work with head nurse who works with physician or GNPTeamwork, Leadership, Culture: NSImplementation tools:* AHRQ CPG
* Staff education
* Work with nursing assistants
* APNs participate in conferences and wound care rounds
 | Length: 6 monthsProcess:* RAs assess risk/collect data
* 2 APNs reassess risk, analyze data (10 hrs/week per facility)
* APNs meet with residents 15‑30 min/wk

Successes:6 months of APN treatment significantly improved 3 of 4clinical problems compare to usual careBarriers:* High turnover of unlicensed staff

Addressing Barriers: NSSustainability: A wound care committee was established at 1 facility. | APN Treatment(n = 86)Pre: 19.8Post: 3.5*x*2 = 3.01(1), *p =* 0.04, one-tailedUsual Care(n = 111)Pre: 17.3Post: 10.0 | “The relatively short time (10 hr per week in each nursing home) and the high turnover rates of unlicensed staff (range of 11%‑45%) reduced opportunities for each APN to establish relationships with staff.” |

APNs: Advanced practice gerontological nurses
CMS: Centers for Medicare and Medicaid
CPG: Clinical practice guidelines
DON: Director of Nursing
EMR: Electronic medical record
GCNS: Gerontological clinical nurse specialist
GNP: General nurse practitioner
GP: General Practitioner
HRPrU: High-risk PU quality measure
Int: Intervention
LPN: Licensed practical nurses
LTACH: Long-term acute care hospital
NS: Not stated
PT: Physical therapist
PU: Pressure ulcer
QI: Quality indicator
QM: Quality measure
RA: Resident assistants
RAI: Resident assessment instrument
RAP RAI: Resident assessment protocols
RCT: Randomized controlled trial
SCI: Spinal cord injury
WCC: Wound Care Certified

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