**Supplementary: Interrupted Time series studies**

**Table 1. Interrupted Time series studies: review authors' judgements about risk of bias for each included study according to EPOC Review Group Checklist1**

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| **ITS studies with control sites** |
| **Study reference** | **Protection against secular changes\*** | **Data were analysed appropriately\*** | **Reason for number of points pre/post intervention**  | **Shape of intervention effect** | **Protection against detection bias** | **Blinded assessment of primary outcomes or objective outcomes** | **Completeness of site follow-up**  | **Reliable primary outcome measures**  |
| Arling et al. 2014 | done | done  | not clear  | done  | done  | not done  | done  | not clear |
| Battersby et al. 2014 | done | done | not clear | done  | done  | not done  | done  | not done  |
| Lynn et al. 2007  | done | not done | not clear | done | done | not done | not done | not clear |
| Power et al. 2010 | done  | SPC | done  | done | done | not done/obj  | done  | done  |
| Shafer et al. 2008 | done | done and SPC  | not clear | done | done | not done/obj  | done  | done |
| Youngleson et al. 2010 | done | SPC  | not clear | done | done | not done/obj  | done  | done |
| **ITS studies without control sites** |
| **Study reference** | **Protection from secular changes** | **Data analysed appropriately\*** | **Reason for points pre and post** | **Shape of intervention effect** | **Protection from detection bias** | **Blinded assessment of primary outcomes** | **completeness of dataset/ follow up** | **reliability of outcome measures** |
| Bonello et al. 2008 | not clear | not done | done  | done  | done | not done  | done | not done  |
| Broughton et al. 2013 | not clear  | not done  | not clear  | done  | done | not done  | done  | not clear  |
| Bundy et al. 2014 | not clear  | done  | not clear  | done  | done  | not done/obj  | done  | not clear  |
| Crandall et al. 2011, 2012 | not clear | SPC  | not clear | done | done  | not done/obj  | done | not clear |
| dePalo et al. 2010 | not clear | not done  | not clear | done | done  | not done/obj  | done | not clear |
| Donovan et al. 2010 | not clear  | SPC  | not clear  | done  | done  | not done  | done | not clear |
| Glasgow et al. 2012 | not clear | done  | not clear | done  | done  | not done/obj  | not clear | done |
| Hayes et al. 2012 | not clear | SPC | not clear | done | done | not done  | not done | not clear |
| Jeffries et al. 2009  | not clear  | not done | not clear | not clear | done | not done/obj  | not done | not clear |
| Kaplan et al. 2011 | not clear | SPC  | not clear | done | done | not done/obj  | done | not clear |
| Koll et al. 2009 | not clear | not done  | not clear | Not clear | done | not done/obj  | done | not clear |
| Miller et al. 2010, 2011 | not clear  | done and SPC  | not clear | done | done | not done/obj | done  | not clear |
| O'Connor et al. 1996 | not clear | not done  | done | done | done | not done/obj | done | not clear |
| Patel et al. 2013 | not clear | done  | not clear | done | done | not done/obj | done | not clear |
| Pierce-Bulger et al. 2001 | not clear  | not done | not clear | not clear | done | not done/obj  | done | not clear |
| Quigley et al. 2014 | not clear | not done | not clear | done | not clear | not done  | not clear | not clear |
| Ralston et al. 2013 | not clear | not done  | not clear | not clear | done | not done | done | not clear |
| Rosen et al. 2013 | not clear | not done  | not clear | done | done | not done  | done  | not clear |
| Siriwardena et al. 2014, Taljaard et al.2014 | not clear | done  | not clear | done | done | not done  | done  | not clear |
| Toltzis et al. 2014 | not clear  | not done  | not clear | done | done | not done  | done | not clear |
| Webster et al. 2012 | not clear | done and SPC  | not clear | done | done | not done | done  | not clear |
| Weeks et al. 2014 | not clear | not done | not clear | done |  done | not done/obj  | done  | not clear |
| Wheeler et al. 2011 | not clear | SPC | not clear | done | done | not done/obj | done | not clear |
| Wirtschafter et al. 2010 | not clear | SPC | not clear | done | done  | not done/obj  | done | not clear |

**\***Although six ITS studies had control sites, comparison of site characteristics between control and intervention sites were not reported for any of these studies and there were differences in control and intervention site performance of the effect measure of interest in two of the six studies (Power et al. 2010 and Youngelson et al. 2010)

\*Statistical Process Control (SPC) charting not included in EPOCH criteria, only ARIMA models or time series regression models

*Interrupted time series studies risk of bias*

There were 30 ITS studies, six (20%)2-7 with contemporaneous control sites. The majority (24/30) were located in the USA,2 4 6 8-28 three from the UK,3 5 29 and three from Africa.7 30 31 The median study period for ITS studies was 42 months (range 11 months to 10 years), far longer than in CBAs (median 27months) and RCTs (median 20 months); 11/30 (37%) studies collected data for four or more years.2 3 7 9 13 19 21 23 27 31 32 Of the six studies that had control sites, comparison of site characteristics between control and intervention sites were not reported for any and there were differences in control and intervention site performance in two of the six studies.5 7 Only 10/30 (33%) were analysed according to EPOC criteria using ARIMA or time series regression models, with an additional eight studies that used statistical process control (SPC) analyses. (Note: EPOC criteria do not specifically provide guidance on the appropriateness of SPC to control for temporal trends.) For the majority of the studies, sources and methods of data collection appeared to be the same before and after the intervention (protection from detection bias). No studies reported blinded assessment of the primary outcomes, but 17/30 (57%) were deemed to be sufficiently objective and two other studies5 13 met criteria for reliability of outcome measures (data captured via an automated system or inter-rater reliability audits with >90% agreement). For 25/30 studies, there was over 80% site follow-up. Of the remaining five studies, three had between 60-77% follow-up4 14 15 and two did not report site attrition.13 22 In summary, the major areas of risk of bias was the lack of control sites, data analyses not meeting criteria, and the lack of blinded or reliable assessment of study outcome measures.

**SQUIRE v.1 standards33 abstracted**

**9. Planning the intervention**

a. Describes the intervention and its component parts in sufficient detail that others could reproduce it

b. Indicates main factors that contributed to choice of the specific intervention (for example, analysis of causes of dysfunction; matching relevant improvement experience of others with the local situation)

c. Outlines initial plans for how the intervention was to be implemented: e.g., what was to be done (initial steps; functions to be accomplished by those steps; how tests of change would be used to modify intervention), and by whom (intended roles, qualifications, and training of staff)

**10. Planning the study of the intervention**

a. Outlines plans for assessing how well the intervention was implemented (dose or intensity of exposure)

**Table 2. Interrupted Time series with and without control sites: Reported QIC intervention, collaborative site engagement**

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| --- | --- | --- | --- |
| **Study reference, country, topic, QIC type** | **Intervention description** | **Assessment of intervention** | **Reported engagement with collaborative process** |
| Arling et al. 2014 USA Falls reductionQIC type NR | Collaborative was centrally organised by Empira with meetings, seminars, networking opportunities and technical assistance from QI experts. The experts assisted the development and implementation of evidence-based practices and strategies through facility-based project co-ordinators. The co-ordinators relied on fall-prevention teams (nursing and other leadership) within their facilities to adapt the strategies to local needs. Project co-ordinators had monthly training sessions for unspecified length of time (curriculum NR)Between meetings there were electronic and in-person communications between QI experts and project co-ordinators. Project data on falls and other outcomes were reported. Participating sites paid a fee to participate. | **Rationale for choosing QIC intervention:** not clear**Topic well described?** the problem with falls not described**Change package** not reported (NR)**Meetings-** number and length (NR), curriculum (NR), Empira hosted, who advised (reported), team composition (reported)**Coaching, support between meetings-** electronic and in-person communications between QI experts and project co-ordinators between meetings (frequency NR) On-site visits NR.**High level management involvement or support or resources -** funding support from Minnesota Nursing Home performance-based Incentive Payment Program. Fees provided by facilities  | Mean of 9.22 meetings attended over mean 2.77 years in the collaborative. Attendance at meetings reported from 29 individuals from the 15 sites. The number of meetings attended was not associated with fall rates. Improvements in fall reduction was positively correlated with communications outside of the meetings. |
| Battersby et al. 2014 UK Breast milk for pre-term infantsQIC type NR  | A formal launch and implementation date was set although unsure whether this was a combined meeting. Following standardisation of training tools, implementation and engagement was through outreach training by project lead and network dietitian and cascaded locally by unit champions. Teams and team composition not reported. After launch, teams required to do PDSA cycles, received monthly newsletters with feedback on unit audits to inform progress and share learning | **Rationale for choosing QIC intervention:** *“offer opportunities through altered clinical behaviours across multidisciplinary teams to deliver cohesive and consistent good practice”***Topic** briefly described but further information on development of care bundle in earlier publication**Change package**-reported both care bundle and training tools **Meetings-** NR other than a formal launch length NR, curriculum other than care bundle (NR), who hosted (NR), who advised (NR), team composition (NR)**Coaching, support between meetings-**site visits (NR) monthly newsletters **High level management involvement or support or resources** (NR) | Attendance at meeting/s NR, Number of changes made or PDSA cycles NR.  |
| Lynn et al. 2007 USA Pressure ulcersQIC type NR | QIC included 3 learning sessions and a final summary conference led by 'collaborative faculty'. Not specified who attended other than teams from nursing homes. Curriculum for meetings included faculty led training, peer-to-peer sharing, QI methods, measurement, and pressure ulcer prevention and treatment. An expert panel selected initial improvement strategies. Other activities included monthly conference calls and e-mail discussions. Qalis Health developed an electronic registry that generated monthly reports of aggregated data for participating sites and on-site coordinators used this registry to identify a random sample of residents to review records. Teams implemented and evaluated changes (rapid cycles) in nursing homes; and entered site data into the registry.  | **Rationale for choosing QIC intervention:** not clear**Topic** well described**Change package** NR other than expert panel selected initial strategies from research, guidelines and expert opinion**Meetings-** three collaborative sessions length (NR), curriculum (briefly reported), who hosted (Qualis), who advised (NR), team composition (NR)**Coaching, support between meetings-** monthly conference calls, e-mail discussions, site visits (NR) **High level management involvement or support or resources** Centers for Medicare and Medicaid contracted with Qualis a QI organisation to lead the collaborative. They and 32 other QI organisations, 7 corporate partners and collaborative faculty provided technical and logistical support for sites.  | 35/61 (57%) nursing homes provided monthly data. Reported ‘high rates’ of attendance at conference calls and learning sessions and ‘many’ queries and comments on the email discussion list. Number of PDSA cycles NR. Faculty members interviewed teams at meetings and conducted 2-hr telephone focus groups with 8 teams to probe details of change in processes and outcomes. |
| Power et al. 2010UK *Clostrium difficile* infectionBTS | QIC included 2 x learning sessions, led by expert steering group from across specialties who identified 4 key areas for change. Teams from 5 wards attended (composition not specified). The curriculum covered theory and practice of improvement (model for improvement and PDSA cycles) and principles of reliability. Teams participated in action periods in which they tested changes. A designated sponsor from the hospital's leadership team supported each of the 5 teams. Executive mentoring ward visits were conducted bimonthly during action periods. Other specific activities for sharing not discussed other than changes noted and shared hospital wide. | **Rationale for choosing QIC intervention:** NR**Topic** briefly described**Change package**- reported as the top 20 changes that pilot wards had developed **Meetings-** two, length (NR), curriculum (briefly reported), who hosted (Salford Royal Hospital), who advised (NR), team composition (NR)**Coaching, support between meetings**, bimonthly mentoring visits each action period (total 18 visits) **High level management involvement or support or resources** – A designated sponsor from the hospital's leadership team supported each of the 5 teams; | Attendance at learning sessions NR, Number of changes made or PDSA cycles NR |
| Shafer et al. 2008USA Organ donationBTS | 3x learning sessions every 3-4 months led by a faculty of 21 experts drawn from 6 organ procurement organisations (OPOs) and 18 hospitals that had achieved and sustained high organ donation rates. OPOs were asked to form improvement teams and work with 1 or more affiliated hospitals. OPOs had to submit applications to participate and fund collaborative team expenses. QIC teams made up of 3-5 persons from both OPO and hospital staff (organ procurement co-ordinators, critical care nurses, intensivists, trauma and transplant surgeons, neuroscientists, OPO and hospital leaders). A system leader and day-to-day leader was identified on each team Learning session curriculum covered the change package, measurement and data requirements, model for improvement and PDSA cycles. Between sessions, teams tested changes via PDSA cycles, shared ideas and lessons learned through monthly conference calls and via an active Internet listserv. Based on site monthly reports and results, the collaborative faculty interviewed high performing teams. The profiled teams presented their specific changes at subsequent learning sessions both in person and on video | **Rationale for choosing QIC intervention:** NR**Topic** well described**Change package** yes**Meetings-** Three meetings, length (NR), curriculum (reported), who hosted (reported), who advised (briefly reported), team composition (reported)**Coaching, support between meetings-** monthly teleconferencing and use of listserv,, Site visits number/frequency NR**High level management involvement or support or resources** To assist the QIC, the Department of Health and Human Affairs convened quarterly meetings of a leadership co-ordinating council (senior executives and elected leaders of 16 major national associations and stakeholders in organ donation) | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
| Youngleson et al. 2010South Africa Mother to child HIV transmissionBTS | QIC was a partnership between Western Cape Provincial Department of Health (DOH), Cape Town Municipality City Health Departments and IHI. QI experts trained managers and collaborated with senior health department officials. There were 6 bi-annual learning sessions and regular on-site meetings. Curriculum included specific QI methods based on the Model for Improvement and PDSA cycles. Methods included setting aims, process mapping of care pathway, using routine data to identify of gaps in care, root cause analysis of these gaps, selection of change ideas to close gaps, and use of rapid-cycle change iterative methods to test improvement ideas. A prototype phase identified successful changes which became the change package. These solutions were spread to sites by the project staff, DOH managers and through routine monthly meetings and 6 learning sessions. Between sessions, primary care clinics and birthing units formed multidisciplinary teams that applied these QI skills at individual sites. Project staff provided on-site mentoring. The intensity of support decreased from fortnightly on-site mentoring in the prototype phase to monthly sub-district meetings in the spread phase as managers became familiar with the methodology.  | **Rationale for choosing QIC intervention:** *“a QI model that promotes change simultaneously across large parts of the system”***Topic** well described**Change package** reported **Meetings-** Six meetings, length NR, curriculum (reported), who hosted (reported), who advised (reported), team composition (NR)**Coaching, support between meetings-**managerial training and on-site clinic visits fortnightly by project co-ordinators reducing to monthly **High level management involvement or support or resources** Senior managers informed with monthly reports; Steering committee of district and DOH managers guided project, sanctioned spread of changes and intervened to remove obstacles. In addition to QIC, policy changes (including protocol change to PCR testing) and additional resources (new clinics) were introduced during study period. | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
|  |  |  |  |
| Bonello et al. 2008USA VAP, CLABSIBTS | QIC consisted of 3 learning sessions of unknown length, unknown who ran them but featured nationally recognized content and process experts. Teams and team composition not well defined (interdisciplinary process improvement team including ICU frontline providers). The curriculum covered a review of relevant literature, PDSA improvement methodology and sharing by teams of lessons learnt. In addition there were visits by VA ICU Collaborative leaders which included educational symposia with review of literature, presentations by site teams to their own leaders and colleagues on progress and barriers to change. Monthly conference calls and sharing via a collaborative website. High level support from senior leadership. Major issues seen to be in the collection, management and reporting of data.  | **Rationale for choosing QIC intervention:** unclear but states ***“****need to develop models to educate and engage healthcare workforce in improvement process”***Topic** well described**Change package** Yes “bundles”**Meetings-** three, length (NR), curriculum (briefly reported) who hosted (reported), who advised (NR), team composition (NR)**Coaching, support between meetings-**collaborative website, monthly teleconferences, site visits occurred but number and length NR**High level management involvement or support or resources** – support from senior leadership but also reported competing organizational demands and externally imposed mandates Some funds made available to offset salary costs but most data collection was an extra duty/additional workload. | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR.Challenges cited- lack of training and education for team-based collaboration, lack of infrastructure for data collection and reporting, lack of physician interest or buy-in and organizational "red-tape".  |
| Broughton et al. 2013Niger Obstetric care | QIC was a shared USAID and Niger Ministry of Health (MOH) project. It involved selecting and validating standards with national and international experts, co-ordinating with MOH to procure equipment and supplies and building trainer/coach technical competence. QIC included clinical and capacity-building sessions with participants, learning sessions, office and administrative support and regular coaching visits to participating sites. Teams (composition not reported) worked with common technical interventions, monitored indicators and came together regularly to share successful changes for achieving rapid results.  | **Rationale for choosing QIC intervention:** A strategy which *“co-ordinated and supported multiple facility-based teams to introduce and overcome barriers to implementing targeted interventions”***Topic** well described**Change package** Yes **Meetings-** meetings number and length (NR), curriculum (NR), who hosted (reported), who advised (briefly reported), team composition (NR)**Coaching, support between meetings-** site visits occurred but number and length NR**High level management involvement or support or resources** QIC funded via USAID in collaboration with Niger MoH | Attendance at learning sessions NRNumber of changes made or PDSA cycles NR |
| Bundy et al. 2014USA CLABSINR | QIC hosted by Children’s Hospital Association (CHA) and involved a faculty of physicians and nurses, infectious disease experts, QI experts and CHA-based support and data management staff. Learning sessions were held semi-annually for 2-days directed by the QIC faculty. Learning sessions included education on QI, data review, teams’ stories of successes and failures, and networking time and exercises. Teams interacted monthly on webinars in which collaborative data were reviewed, successes and stumbling blocks were presented by teams, and QI principles were reinforced. Teams asked to implement care bundles developed by the faculty, do monthly audits, report data and complete annual site survey.  | **Rationale for choosing QIC intervention:** NR**Topic** well described**Change package** reported “bundles”**Meetings-** 2-day sessionsNumber of sessions (NR but likely to be 2-3 given QIC timeline), curriculum (reported), who hosted (reported), who advised (reported), team composition (not clear)**Coaching, support between meetings-**Monthly webinars **High level management involvement or support or resources** (NR) | Attendance at meetings or webinars NRNumber of changes made or PDSA cycles NR |
| Crandall et al. 2012Crandall et al. 2011USA Paediatric inflammatory bowel disease (IBD)BTS  | QIC consists of learning sessions with multidisciplinary teams (not specified) with nationally recognized QI experts providing training, tools and support for system redesign and incorporating improvements into daily practice. Curriculum covered-model for improvement, changes consistent with Chronic care model, high reliability principles, team building, skills for managing data and change, mutual learning, measurable and achievable targets. Between sessions, teams tested changes and collected data. Coaching occurred (no further description) at participating centers, listserv, monthly all-site conference calls, semi-annual webcasts (teams from all sites gather for learning and sharing). QIC had extranet containing tools and reports that sites could download. | **Rationale for choosing QIC intervention:** *“a method to support the development of an enduring collaborative improvement network”***Topic** well described**Change package** developed by Paediatric Inflammatory Bowel Disease network**Meetings-** meetings (frequency and length NR), curriculum (briefly reported), who hosted (reported), who advised (not specified), team composition (NR)**Coaching, support between meetings-**coaching (by whom, frequency and length NR)email listserv, monthly conference calls and semi-annual webcasts. Site visits (NR)**High level management involvement or support or resources** Paediatric Inflammatory Bowel Disease network was awarded 2 year grant in cooperation with the North American Society for Paediatric Gastroenterology, Hepatology, and Nutrition | Attendance at meetings and conference calls NR but mentions monthly 'all site' conference calls; webcasts where teams from 'all sites' gather for sharing and learning.Number of changes made or PDSA cycles NR |
| dePalo et al. 2010USA CLABSI and VAPKeystone | QIC led by representatives of Rhode Island Quality Institute, Quality Partners of Rhode Island (QPRI) and Hospital Association of Rhode Island. Leadership team included representatives from these organisations, a physician consultant to QPRI and an ICU physician consultant. Advised by Johns Hopkins consultants (content of educational sessions and conference calls). Frequency and number of learning sessions (NR). Stated quarterly conference calls with physician champions, bimonthly team-led forum to share best practice and challenges. Each ICU team had multidisciplinary champions, ICU director and a senior executive partner. Curriculum included Comprehensive Unit Based Safety Program (CUSP) and change strategies. CUSP includes science of safety, identifying hazards, identifying senior executive partners, learning from defects and implementing teamwork tools. Each ICU was visited to assess data collection and utilisation (before QIC) and also reported customised consultation at each site (by who, when?)  | **Rationale for choosing QIC intervention:** wanting to replicate achievements from another QIC and expand state-wide. **Topic** well described**Change package** yes ‘bundles”**Meetings-** learning sessions freq , length and number (NR), curriculum (briefly reported), who hosted (reported), who advised (reported), team composition (not clear)**Coaching, support between meetings-** conference calls quarterly with physician champions, bimonthly team-led forums. Site visit pre-QIC.**High level management involvement or support or resources** – high level leadership from all of state quality institutes, and Hospital Association. CEO provided formal commitment letter. Funding provided by insurers for project management, logistics and speakers of learning sessions and face-to-face meetings and consultants. Hospitals provided in kind; costs of data collection, time for meetings, calls and learning sessions, CME hours and statistical analysis | Attendance at meetings and conference calls NRTeam culture assessed via Safety Attitudes Questionnaire (pre- and post-QIC?)Completeness of reporting very high (over 90%) for all sites Number of changes made or PDSA cycles NR |
| Donovan et al. 2010Bailit et al. 2012USA deliveries <39 weeksBTS | Describes QIC faculty with expertise in QI, data management, perinatal vital statistics, neonatology, and maternal fetal medicine. QIC included 3 learning sessions. Curriculum not described. Teams included at least one nurse, data manager and physician. Monthly aggregate and site-specific reports data were available to each site. Sharing was possible during monthly conference calls, periodic webinars and second and third learning sessions. Sites were encouraged to adopt as many interventions appropriate to their site in the order to meet the project goal and asked to collect data.  | **Rationale for choosing QIC intervention:** not clear writes that is a way of “*introducing and sustaining health improvement projects”***Topic** well described**Change package** reported**Meetings-** three, length (NR), curriculum (NR), who hosted (briefly reported), who advised (briefly reported), team composition (reported)**Coaching, support between meetings-** monthly conference calls, and periodic webinars (?frequency), site visits NR **High level management involvement or support or resources** Funded partly: Ohio Department of Jobs and Family Services | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR  |
| Glasgow et al. 2012USA hospital length of stay and rate of discharges before noonBTS | Veterans Affairs (VA) QIC had national steering committee, each region with leadership team (2 co-directors responsible for overall leadership and serving as core faculty and 2 co-coordinators for day-to-day management) and QI improvement team (one member being a hospital executive). The improvement teams participated in a telephonic ‘pre-work’ session and 3x face-to-face 1.5-2 day long learning sessions. Curriculum included key flow principles for measuring and addressing demand variation as well as change management tools. At ongoing learning sessions, 2-3 individuals from improvement team participated. Teams required to adopt VA framework for improvement including aims, measurement and PDSA | **Rationale for choosing QIC intervention:** not clear **Topic** briefly described**Change package** NR**Meetings-** three +pre-work teleconference, length (1.5-2 day), curriculum (briefly reported), who hosted (reported), who advised (NR), team composition (NR)**Coaching, support between meetings-**no activities reported other than QI coaches gave verbal and written feedback to teams throughout. Site visits NR**High level management involvement or support or resources-** Regional management and hospital executive on QI team. | Attendance at meetings and conference call NRNumber of changes made or PDSA cycles NR  |
| Hayes et al. 2012USA paediatric cardiopulmonary arrestsBTS | Collaborative was designed by a multidisciplinary paediatric advisory panel with participating hospital staff and external subject matter experts. Included 3 face-to-face learning sessions. Teams were multidisciplinary and had a designated sponsor (physician/or administrative). Curriculum included change package and PDSA cycles. Teams applied small tests of change or could apply six-sigma QI methods. Support via monthly conference calls, collaborative listserv, and project Web page), and monthly data submission through a secure Web-based data repository hosted by IHI | **Rationale for choosing QIC intervention:** not clear **Topic** well described**Change package** reported**Meetings-** three meetings unknown length, curriculum (briefly reported), who hosted (NR), who advised (Not specifically reported), team composition (NR)**Coaching, support between meetings-** monthly conference calls, collaborative listserv, project Web page). Site visits NR**High level management involvement or support or resources** Teams included a sponsor | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR AHRQ survey at beginning, mid and conclusion of intervention on patient safety culture. Only domain with stat sig improvement was non-punitive response to error.  |
| Jeffries et al. 2009USA CLABSIModified BTS | QIC led by two improvement trained directors from Child Health Corporation of America (CHCA), experts in infectious disease, improvement advisors, clinicians and performance consultants. This panel developed intervention package. QIC had two meetings. Curriculum not clear other than teams collected data and shared this at initial and subsequent meetings and discussed successes and challenges. Teams had quarterly conference calls for an additional 12 months. CHCA produced monthly reports for teams and regularly communicated progress to key stakeholders (CEOs and quality and safety leaders). Each team asked to engage senior leaders to remove barriers to implementation. | **Rationale for choosing QIC intervention:** as a way to *“accelerate translation of evidence to clinical practice, enhance patient safety, produce better outcomes and reduce costs”***Topic** well described **Change package** Yes “bundles”**Meetings-** two meetings (length NR) curriculum (not clear), who hosted (NR), who advised (not clear), team composition (NR)**Coaching, support between meetings-**conference calls quarterly, and monthly reports to teams,site visits (NR)**High level management involvement or support or resources** (NR) | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR Teams submitted monthly team self-assessment scores, qualitative reports on barriers, successes and lessons learnt but assessment scores not reported. |
| Kaplan et al. 2011USA Late onset bacterial infections in preterm infants 22-29 weeksBTS and VON | All Ohio state Neonatal ICUs that were part of VON Very Low Birthweight registry were eligible to participate. QIC included three full-day learning sessions. Teams included a physician, nurse, data manager and up to 3 additional members. In addition there were monthly web-based seminars to share aggregated and site-specific data as well as strategies for change. Curriculum NR other than instructions on how to implement PDSA method.  | **Rationale for choosing QIC intervention:** a way “*to increase use of evidence-based care”* and promote “*reliable simultaneous implementation of multiple aspects”***Topic** well described**Change package** insertion and maintenance bundles reported**Meetings-** three day-long meetings, curriculum (NR), who hosted (reported), who advised (not clear), team composition (reported)**Coaching, support between meetings-**monthly webinars, site visits NR**High level management involvement or support or resources** Supported by a central staff with QI expertise and data management infrastructure. Senior administrators required to approve participation | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR  |
| Koll et al. 2008USA CLABSINR | QIC led by VP of quality and patient safety of one organization and project director of quality strategies initiative of another with senior analyst to provide day-to-day support to hospitals. Senior physician was expert on-call and research institute provided quantitative and analytical support. Hospital teams included ICU physicians, nursing staff, infection control staff and health professionals where central lined were placed and materials managers to ensure kits available. Three meetings with biweekly conference calls in between. Teams had website to share best practices, and real-time question and answer forum from both experts and peers. Infectious disease expert conducted site visits to three-quarters of participating hospitals (number and frequency NR). External and Internal leadership: Internal leadership continually monitoring data and questioning staff when rates increased; leaders of collaborative met with senior leaders of hospitals to discuss current practice and request support to make system changes and create sustainable model. | **Rationale for choosing QIC intervention:** “*opportunity for a total paradigm shift in infection control practice. By holding every health worker accountable for reducing and eliminating hospital acquired infections* (sic not just infection control department*)”* and with “*mandate of support from hospital leadership and sharing best practice across facilities that would normally be competitors (*would) *replace a long-standing culture of blame with an environment of co-operative, sustainable problem solving.***Topic** well described**Change package** reported “bundles”**Meetings-** three, length (NR), curriculum (NR), who hosted (reported), who advised (reported), team composition (reported)**Coaching, support between meetings-** infectious disease expert on call for support who also conducted site visits (number and frequency site visits NR); biweekly conference calls.**High level management involvement or support or resources:** Funds and support provided for project management; participating hospitals required to complete application with mandated signatures from CEO, CMO and designation of team. Hospital leadership committed to support staff participation in learning sessions, identify appropriate staff for collaborative team and facilitate a hospital-wide approach to reducing infections. | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR 10 months into the initiative, hospitals were asked to complete an interventions survey about implementation of bundle components, educational programmes, competency assessments, root cause analysis procedures, and special efforts to other units. |
| Miller et al. 2010Miller et al. 2011USA CLABSI | National Association of Children's Hospitals and Related Institutions hosted QIC. Teams attended 4 learning sessions in the first year (2 learning sessions in subsequent years with new PICUs). Team composition included senior PICU leader/physician champion and QI leaders, infectious disease physicians, PICU nursing leaders and/or infection control professionals. Curriculum NR but insertion and maintenance bundles specified. Teams used QI methods of small tests of change, tested and implemented changes to make their care commensurate with insertion and bundle practices.Team involved in monthly conference calls and monthly data collection and submission. | **Rationale for choosing QIC intervention:** not specified other than QICs have had success for reducing CLABSI in adults **Topic** well described**Change package** reported “bundles”**Meetings-** four meetings length (NR), curriculum (NR), who hosted (reported), who advised (NR), team composition (reported)**Coaching, support between meetings-**monthly conference calls, site visits (NR)**High level management involvement or support or resources** (not clear) Participating teams needed to pay a fee to cover project management costs and to pay for 2-3 team members to travel to learning sessions. Required around 0.4 FTE registered nurse level to support data collection, data entry and local QI efforts | Attendance at meetings and conference calls NR. Number of changes made or PDSA cycles NR. |
| O'Connor et al. 1996Malenka et al. 1998Nugent et al. 2005USA Cardiac Surgery- Coronary artery bypass graft (CABG) mortalityNorthern New England CVD study group (NNECVDSG) | Since 1990 3x 2-day meetings each year provided a forum for surgeons to discuss/benchmark risk adjusted outcome data between institutionsIn 1990 QIC itself started with a 2-day training session conducted for the executive committee of the study group, and two 4-hour QI training sessions for the general membership of the group. Curriculum reported as theory and techniques based largely on the writings of Deming and the use of these methods in medical care settings. Teams typically made up of cardiac surgeon and perfusionist, other teams also had nurse, anaesthesiologist. During 1990-91 a series of peer-to-peer site visits occurred to observe host processes of CABG surgery. Processes and outcomes were monitored continuously by the NNECVDSG (voluntary research consortium composed of clinicians, scientists, and hospital administrators) | **Rationale for choosing QIC intervention:** as a method that *“permits health care professionals to compare and contrast their knowledge, theories and practices.”* Also an approach for dealing with rare adverse events. **Topic** well described**Change package** NR**Meetings-** 3x 2 days meetings + 2 x4hr QI training , curriculum (very brief), who hosted (NR), who advised (NR), team composition (reported)**Coaching, support between meetings-**peer site visits, number and frequency (NR)**High level management involvement or support or resources** NNECVDSG provided infrastructure to collect and share data.  | Attendance at meetings NR. Number of changes made or PDSA cycles NR. |
| Patel et al. 2013USABlood stream infections in haemodialysis patientsNR | Hosted by US Centres for Disease Control and Prevention (CDC). QIC included yearly in-person meetings, monthly conference calls, reporting data to National Health Safety Network (NHSN) and implementation of change package. This was developed via experts presenting evidence for recommended practices and participants voting on what should be included in the QIC. Faculty (CDC staff, experts and representative from 3 sites) developed the change package further and presented to all members for final approval. Sites provided with audit tools to support implementation. Curriculum at meetings and conference calls – infection prevention, network with other providers, share experiences and stories. Sites provided with progress reports by facility , by QIC and by all dialysis facilities reporting to NHSN. | **Rationale for choosing QIC intervention:** not specified other than methodology that has had success for reducing bloodstream infections**Topic** well described**Change package** reported**Meetings-** 1 meeting/year length (NR), curriculum (reported), who hosted (reported), who advised (reported), team composition (NR)**Coaching, support between meetings-** monthly conference calls **High level management involvement or support or resources** CDC and NHSN provided experts and infrastructure | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
| Pierce-Bulger et al. 2001USA Post-neonatal Infant MortalityNR | QIC reported meetings but number, length, who hosted, who advised, who attended was not reportedTeams trained to use QI principles to address public health problem and to use numerous rapid cycle improvements via PDSA, tested interventions and develop learnings about system and clients | **Rationale for choosing QIC intervention:** not reported**Topic** briefly described**Change package** NR**Meetings-** meetings number and length (NR), curriculum (briefly described), who hosted (NR), who advised (NR), team composition (NR)**Coaching, support between meetings-** NR**High level management involvement or support or resources** NR | Attendance at meetings NR; Number of changes made or PDSA cycles NR |
| Quigley et al. 2014USA Falls reductionNR | QIC consisted of a development of organisational readiness assessment survey for VA sites, falls prevention programme with 5 components, and a plan to address each element. Expert faculty (geriatrician, nurses, epidemiologist, engineer, occupational therapists) provided monthly web-based lectures for 6 months with coaching and mentoring via biweekly conference calls and email exchange. Each program component was implemented using expert lectures, plans for small tests of change, report of results, coaching, and mentoring. In addition, a follow-up plan over 5- to 8-week intervals based PDSA cycles. All education sessions were web-based, offered virtually by conference call and shared presentations. Results were reported to all participants and shared lessons learned across sites. At the end of the implementation project, a 2-day meeting was held to bring site peer leaders together and review results of the post-implementation survey.  | **Rationale for choosing QIC intervention:** not reported**Topic** well described**Change package** reported**Meetings-** monthly lectures, length (NR) curriculum (reported), who hosted (reported), who advised (reported), team composition (NR)**Coaching, support between meetings-** biweekly conference calls (length NR) and e-mail exchange**High level management involvement or support or resources** supported by VA infrastructure and leadership | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR Study had both qualitative and quantitative evaluation including a staff survey as well as reported falls rates. Changes in level of implementation for each fall injury program component were reported. Scores ranged from 0 (no activity) to 3 (fully implemented) but were not statistically significant. |
| Ralston et al. 2013USA BronchilolitisNR | Group consensus identified therapies and tests in alignment with clinical practice guidelines. The first meeting facilitated sharing of resources to promote evidence-based care and benchmarking baseline data. Teams included paediatric hospitalists. Most sites began PDSA cycles post first meetingSome centres participated in more extensive collaborative activities (small group goal setting, adoption similar protocols and conference calls) but not more than 25% of the networkMain product was yearly meeting with benchmarking report and honouring high performers. Tools and strategies shared via project website. | **Rationale for choosing QIC intervention:** as a means of *“linking academic and community-based hospitalist groups to disseminate evidence-based management strategies”* and that *“group norming through bench-marking and public goal setting…would decease overall utilization of non-evidence-based therapies”***Topic** well described**Change package** Not specifically**Meetings-** yearly meetings (length NR), curriculum (briefly reported), who hosted (NR), who advised (NR), team composition (reported)**Coaching, support between meetings-** None although voluntary activities by some. Sharing via website.**High level management involvement or support or resources S**tandardised data collection toolkit provided and data infrastructure. All costs paid by individuals or their institutions | Attendance at meetings NR; Number of changes made or PDSA cycles NR |
| Rosen et al. 2013USA rapid response teamsNR | A steering committee (physicians, nurses and quality leaders) from participating hospitals guided development of data definitions, measures, analysis and education. A physician consultant provided expert guidance during collaborative. The QIC included 4 learning sessions to introduce teams to the initiative and to focus on topics of interest. At the final session a 4-minute video was developed to support sustainability. Regular conference calls were reported. Teams shared information during learning sessions and conference calls, such as tools developed by their respective hospitals. Team composition was diverse but all encouraged to have respiratory therapist, nurse and critical care clinician. Site visits reported but not who visited and how often. In addition two thirds of the hospitals were visited by staff from Greater New York Hospital Association and United Hospital Fund to review and benchmark site data with overall performance with hospital leadership, QI staff and team members. | **Rationale for choosing QIC intervention:** a way to *”accelerate learning and widespread adoption of best practices.”***Topic** well described**Change package** NR**Meetings-** four meetings (length NR), curriculum (reported), who hosted (reported), who advised (reported), team composition (reported)**Coaching, support between meetings-** Conference calls, site visits (number and frequency NR). and email exchanges**High level management involvement or support or resources** Infrastructure and support provided by Greater New York Hospital Association and United Hospital Fund. Participation required site leadership to commit to allowing staff time for learning sessions, conference calls and submit data. | Attendance at meetings or conference calls NR; Number of changes made or PDSA cycles NR |
| Siriwardena et al. 2014Taljaard et al. 2014UK AMI and strokeNR | QIC funded by the Health Foundation and supported by CEOS and medical directors of ambulance trusts and reported to the National Ambulance Services Clinical Quality Group. An expert team (QI, service and clinical expertise, data analyst, facilitators and administrative support) supported local teams. They adopted pre-existing care bundles based on best practice. There were 3 national group meetings, coordinating meetings and local workshops on QI methods. Teams included emergency care providers, paramedics, technicians and assistants. Teams implemented PDSA cycles to test process redesign and develop tools/interventions. These were initially piloted and if proved effective, were spread more widely across one trust and shared with other trusts at meetings and monthly teleconferences. QIC had an electronic repository to store and disseminate information. Facilitators reported monthly through a written feedback form, shared during monthly teleconferences. Control charts of weekly performance data were fed back to local teams three monthly. Peer site visits used staff from early adopter sites to facilitate workshops in trusts that were slower to make progress.  | **Rationale for choosing QIC intervention:** not specified other than have been used in acute and primary care with some evidence for effectiveness **Topic** well described**Change package** reported “bundles”**Meetings-** three meetings length NR, co-ordinating meetings (number and length NR) , local workshops (number and length NR), curriculum (reported), who hosted (reported), who advised (reported), team composition (reported)**Coaching, support between meetings-** Monthly teleconferences and electronic repository. Peer site visits (number/frequency NR)**High level management involvement or support or resources** Supported by CEOs and medical directors. National QIC provided QI and data infrastructure support. | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
| Toltzis et al. 2014USA paediatric surgical site infectionsBTS | QIC included biannual face-to-face meetings for 2.5 years and monthly conference calls. Teams were trained in the Model for Improvement and a surgical site infection intervention bundle Data was reported monthly. Each hospital developed an SSI reduction leadership team including surgical, anaesthesiology and infection prevention professionals who ensured adherence to the bundle components and alerted surgical/anaesthetic team in event of a breach. | **Rationale for choosing QIC intervention:** Argues that successful QI requires *“an orchestrated effort, including strong administrative leadership willing to commit energy and financial resources to task at hand, a scientific approach to improvement and a sophisticated understanding of health delivery systems and human behaviour”* and that collaboratives are an approach that improves *“the potential success in these endeavours.”***Topic** well described**Change package** reported “bundles”**Meetings-**assume 5 meetings (length NR) curriculum (briefly reported), who hosted (reported), who advised (NR), team composition (reported)**Coaching, support between meetings-** monthly conference calls. Site visits NR**High level management involvement or support or resources**  Required “unequivocal commitment” by top administrators at each site and promotion of a culture of change | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
| Webster et al. 2012South Africa Highly active antiretroviral (HAART) coverage for HIV/AIDSBTS | QIC faculty drawn from IHI and WRHI (Wits Reproductive Health and HIV Institute) in partnership with local Health departments. The project was structured into 4 phases.Phase I: small pilot testing QI approachesPhase II: 4 learning sessions with a tertiary hospital, community health centre and 7 primary healthcare clinics. Attendees included regional and district managers and teams from each clinic including nurses, data clerks, administrative staff, housekeepers, security, counsellors, and a doctor where available. Curriculum included QI methods, setting collective regional targets, reviewing progress towards targets and learning from each other best practices. Between meetings, teams met biweekly for 1-2 hrs and coached by Quality managers (QMs) to identify ways to improve care, help teams set clear targets, use root cause analysis to understand system barriers, process mapping, data review, pareto chart analysis and PDSA cycles to test change strategies. Teams collected monthly data for QMs to track progress on targets and a visual dashboard was created.Phase III 4 learning sessions with additional 7 clinics and district hospitalPhase IV- post-intervention when IHI and WRHI support scaled back | **Rationale for choosing QIC intervention:** not specifically other than “*a health services strengthening intervention”* **Topic** well described**Change package** reported**Meetings-** 9x 1-day learning sessions, biweekly 1-2 hour meetings, curriculum (reported), who hosted (reported), who advised (reported), team composition (reported)**Coaching, support between meetings-** QMs coaching biweekly within sites.**High level management involvement or support or resources** regional and district managers involved and provided extra resources, time and staff to collect data. QIC had QM managers and 2 project managers. WRHI also provided supplemental staffing to provide clinical training/support.  | Attendance at meetings NR; Number of PDSA cycles NR but reported a list of tested changes Found that many teams did not meet biweekly but usually with monthly with staff meetings and, as experience rose, clinic facility managers took over from QMs. |
| Weeks et al. 2014USA Central line daysKeystone | QIC led by a partnership including American Hospital Association, Johns Hopkins Medicine Armstrong Institute and Michigan Health and Hospital Association Keystone Centre. QIC had centralised education, data collection and programme management. Meetings- number, length, who hosted, who advised, who attended NR. One feature embedded in “On the CUSP: Stop BSI” was the use of a daily goals instrument to set daily goals of care for each patient and gain shared understanding across the interdisciplinary team. Leaders of participating units reported on a monthly basis their adherence to bundles using the Team Check-Up Tool (TCT)Teams implemented (1) five activities of the CUSP intervention including implementing teamwork tools that address the individual unit’s specific communication and teamwork challenges; (2) CLABSI Prevention Bundle (3) measured and provided feedback about CLABSI rates and results of unit-level patient safety culture scores to unit-based improvement teams and senior leaders | **Rationale for choosing QIC intervention:** not specific other than previously successes with approach and in discussion state that findings *“reinforce other findings that coordinated efforts targeting compliance with evidence-based practice and safety culture improvement can be effective”* **Topic** well described**Change package** reported “bundles”Meetings- number and length NR, curriculum (reported), who hosted (reported), who advised (NR specifically), team composition (NR)**Coaching, support between meetings**- None reported**High level management involvement or support or resources** Agency for Healthcare Research and Quality and Sandler Foundation funded the nationwide implementation of “On the CUSP: Stop BSI. Each team had a senior executive to partner.  | Attendance at meetings NR; Number of changes made or PDSA cycles NR |
| Wheeler et al. 2011USA CLABSIBTS | Leadership team of stakeholders, subject expert physicians and nursing leaders, QI consultant and data analysts and senior leader/sponsor from Patient Care Committee of the Board of Trustees. Monthly learning sessions that covered the change package, measurement and data requirements and model for improvement. Also had conference calls, online resources and monthly reporting. Teams from various wards and units required to test and implement PDSA cycles, discuss strategies/lessons learned at monthly meetings. The leadership team met every 2 weeks, met with local champions who had monthly collaborative meetings gave monthly updates to patient safety officer and QI director and involved in monthly conference calls and email listserv. | **Rationale for choosing QIC intervention:** the approach has been “*frequently used to improve health care quality”***Topic** well described**Change package** reported “bundles”**Meetings-** Monthly meetings (length NR), curriculum (briefly reported), who hosted (reported), who advised (reported), team composition (NR)**Coaching, support between meetings-** conference calls monthly, online resources and email listserv. Site visits- N/A multiple units within one site**High level management involvement or support or resources** problems arising needing resolution went through senior leader/sponsor for resolution | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |
| Wirtschafter et al. 2010USA Neonatal CLABSINR | QIC hosted by California Perinatal Care Collaborative (California Children's Service, California Children's Hospital Association). Project team leaders not specified. A change package was developed by consensus and evidence.There were 3 learning sessions with teams from NICUs included physicians and nurses and infection control leaders and staff. Curriculum included organizational assessments for each NICU, QI methods, best practices; tool kit that included model for improvement and other QI techniques. There were biweekly conference calls with project team and a listserv and website for sharing data and documents. The project team visited each site to provide tailored clinical and administrative consulting  | **Rationale for choosing QIC intervention:** an *“effective way to gain provider attention and organizational focus on implementing clinical proven ‘best practices’.”* **Topic** well described**Change package** Yes **Meetings-** three meetings (length NR), curriculum (reported), who hosted (reported), who advised (NR), team composition (reported)**Coaching, support between meetings-** biweekly conference call, listserv, website and site visits (frequency and length NR)**High level management involvement or support or resources** strategic commitment and sponsorship was obtained from executives of California Children's Hospital Association and California Children's Service. The executives of each hospital monitored the results and helped NICU teams obtain resources and align objectives. | Attendance at meetings and conference calls NRNumber of changes made or PDSA cycles NR |

\*QIC type: BTS Breakthrough Series, VON Vermont Oxford Network, NR Not Reported;

\*NR= not reported; QI= quality improvement; PDSA = Plan, Do, Study, Act; IHI = Institute for Healthcare Improvement

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