THE USE OF FLOWCHARTS IN HOSPITALS

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QUESTION

What evidence exists on the effectiveness of flow charts in conveying critical information within hospital procedures, and what design principles or best practices are supported by research for creating clear, user-friendly flow charts?

RESULTS

ONLINE RESOURCES

ARTICLES & BLOG POSTS

The Microsystem Academy. (2025). **Quality by Design First Edition Part Two – Ch. 17 Process Mapping.** Link.

- Defines process-mapping techniques, with a focus on high-level flowcharts and deployment flowcharts.

HCI. (2024). **Flowcharting – How to Draw a Flowchart**. Link.

- Provides information on how to construct effective flowcharts.

University of Nebraska Medical Center. (2023). **Tools of the Trade: How Flowcharts can aid Quality Improvement in Healthcare**. Link.

- Article describing a training session on using flowcharts in a healthcare setting.

GOVERNMENT DOCUMENTS & GUIDELINES

Safe Care Victoria. (2024). **Process Mapping**. Link.

- Document providing information on how to create a process map and further resources.

Agency for Healthcare Research and Quality. (2021). **Flowchart**. Link.

- Provides examples of flowcharts used in healthcare settings and instructions on how to use flowcharts effectively.

Clinical Excellence Commission. (2016). **Flow Charts**. Link.

- Provides a template on a flowchart used in a healthcare setting.

PEER-REVIEWED JOURNAL ARTICLES – MOST RECENT FIRST

Articles are grouped by theme:

- QI/Implementation
- Nursing & Allied Health
- Emergency
- Paediatrics
- Imaging
- Surgery

Each article summary contains excerpts from the abstract and an online link.

QI/IMPLEMENTATION

O'Leary, M. C., et al. (2023). **Optimizing process flow diagrams to guide implementation of a colorectal cancer screening intervention in new settings**. *Cancer Causes & Control, 34*(Suppl 1), 89–98. Full text

The goal of this study was to assess acceptability of using process flow diagrams depicting a previously implemented evidence-based intervention (EBI) to inform the implementation of similar interventions in new settings. We developed three different versions of process maps, each visualizing the implementation of the same multicomponent colorectal cancer (CRC) screening EBI in community health centers but including varying levels of detail about how it was implemented. Interviews with community health professionals and practitioners at other sites not affiliated with this intervention were conducted. We assessed their preferences related to the map designs, their potential utility for guiding EBI implementation, and the feasibility of implementing a similar intervention in their local setting given the information available in the process maps. Eleven community health representatives were interviewed. Participants were able to understand how the intervention was implemented and engage in discussions around the feasibility of implementing this type of complex intervention in their local system. Our findings showed that there is potential to use this type of quality improvement tool to support implementation of evidence-based interventions in new settings.

Komashie, A., & Clarkson, P. J. (2020). **Requirements for diagramming in the design of mental health delivery services.** *Proceedings of the Design Society*, *1*, 1959–1968. Full text

The goal of our analysis was to identify what we consider a set of requirements that a diagram or diagramming approach designed for mental health services will have to satisfy to be effective. In conclusion, it recognised four key themes which it proposes as key requirements for diagramming in mental health delivery systems - Clear logical flow (with subthemes “good layout”, “clear start with feedback”, “clear flow of activities”, “good use of colour” and “good use of language”), Taking account of patient experience, Taking account of wider system and Taking account of system goals.

Colligan, L., et al. (2010). **Does the process map influence the outcome of quality improvement work? A comparison of a sequential flow diagram and a hierarchical task analysis diagram**. *BMC Health Services Research, 10*, 7. Full text

This exploratory study examined whether the type of process map - sequential or hierarchical - affects healthcare practitioners' judgments. A sequential and a hierarchical process map of a community-based anti-coagulation clinic were produced based. Clinic practitioners were asked to specify the parts of the process that they judged to contain quality and safety concerns. The process maps were then shown to them in counter-balanced order and they were asked to circle on the diagrams the parts of the process where they had the greatest quality and safety concerns. This was followed by a structured interview. Quality and safety concerns cited by practitioners differed depending on whether they were or were not looking at a process map, and whether they were looking at a sequential diagram or a hierarchical diagram. More concerns were identified using the hierarchical diagram compared with the sequential diagram and more concerns were identified in relation to clinical work than administrative work. Participants' preference for the sequential or hierarchical diagram depended on the context in which they would be using it. The difficulties of determining the boundaries for the analysis and the granularity required were highlighted. The results indicated that the layout of a process map does influence perceptions of quality and safety problems in a process. In quality improvement work it is important to carefully consider the type of process map to be used and to consider using more than one map to ensure that different aspects of the process are captured.

NURSING & ALLIED HEALTH

Wikjord, K., et al. (2017). **Effects on nutritional care practice after implementation of a flow chart-based nutrition support protocol in an intensive care unit**. *Nursing Open, 4*(4), 282–291. Full text

This retrospective observational study compared nutritional care practice in one ICU before and after modification of its nutrition support protocol: Several comprehensive documents were substituted with one flow chart and early EN was encouraged. Nutritional data were collected from admission up to 7 days in 25 patients before and 25 patients after protocol modification. The study concluded that the implementation of a flow chart- based, nurse- driven nutritional support protocol in the ICU resulted in more appropriate nutritional support according to current guidelines, with a significant increase in the early use of enteral feeding and reduced use of PN.

Beydag, K. D., & Kömürcü, N. (2012). **Development and area adaptation of flow charts related to gynecologic oncology nursing practices**. *Asian Pacific Journal of Cancer Prevention, 13*(5), 2163–2170. Full text

This one group semi-experimental study was performed to develop and adapt flow charts of nursing practices applied to gynecologic oncology patients to the field. The scope of the study included 97 midwives/nurses who had been working as caregivers of gynecologic oncology patients in this unit at least for 6 months. The data were in descriptive information form collected via "Forms to Determine the Efficiency of Flow Charts". Questionnaires to determine activity were applied to participants

before and after practice. Results: As a result of the study, it was determined that the efficiency of the flow charts increased significantly (p <0.01) after practice of the participants, no significant relationships (p>0.01) being apparent with age group, education level, occupational period in the job and in the gynecologic oncology field and evaluations of the practice before and after it was applied. The results of the questionnaires indicated that nursing participants were believing in the efficiency of the flow chart which was indicated by their willingness level for application.

Sahin, S. et al. (2012). **Developing and implementing flow diagrams for nursing processes in family planning, genital infections and menopausal period**. *HealthMED, 6*(2), 483-491. Request full text

In view of the importance and efficacy of flow diagrams, this study was designed as a semi-experimental study with a single group to guide development and implementation of flow diagrams for nursing practices in family planning, genital infections and menopausal period. The study was carried out at 6 gynecology hospitals in Istanbul. The sample of the research included a total of 90 nurses and midwifes. 11 flow diagrams were developed for nursing practices in family planning, genital infections and problems during menopausal period. Participants were asked to provide their opinions regarding these flow diagrams and revisions were made accordingly. They were asked to use the flow diagrams with at least one patient and then to provide further comments on the flow diagrams and the final versions of the flow diagrams were developed following these comments. There was a significant difference between participants' comments on using the processes described in flow diagrams before and after administering them. The nurses and midwifes found our flow diagrams effective and they showed increased confidence in the benefit of flow diagrams.

Webb, D. C., et al. (2011). O**utcomes of a shoulder treatment flowchart in patients with axillary burns**. *Journal of Burn Care & Research, 32*(2), 224–230. Request full text

The purpose of this study was to evaluate the effects of a structured shoulder treatment flowchart on range of motion (ROM) and function of the upper limb in patients at high and low risk of contracture after an axillary burn injury. Consecutive patients with axillary burns were managed according to a structured pathway based on risk of contracture. In conclusion, a shoulder treatment flowchart with standardized splinting and exercise regimens was associated with good outcomes for shoulder range of movement and function 3 months after axillary burn injury.

EMERGENCY

Campos R.K.G.G.; et al. (2023). **Implementation of a flowchart in emergency unit during the pandemic of COVID-19**. *Escola Anna Nery Revista de Enfermagem,27*:e20220233. Full text

This study describes the experience of the health team in the implementation of a flowchart in an Emergency Care Unit (ECU) during the COVID-19 pandemic. It synthesises the experiences of around 116 professionals involved in actions such as registration, risk classification, clinical evaluation and

physical examination, immediate notification, collection of laboratory tests, collection of nasopharynx swab, hospitalization. The increase in cases of COVID-19 brought the need to reorganize the flow of care in health services and one of the strategies performed in the ECU occurred through the implementation of a flowchart that ensured agility in the dynamics of care provided to the user with respiratory symptoms, allowing clinical management and application of appropriate sanitary measures, as well as the early diagnosis of cases of infection by the new coronavirus. In conclusion, the implementation of the flowchart streamlined the identification of possible positive cases, reduced the time to start care for this patient, and the exposure of the patient and health professional.

Buntine, P., et al. (2019). **Effect of a clinical flowchart incorporating Wells score, PERC rule and age-adjusted D-dimer on pulmonary embolism diagnosis, scan rates and diagnostic yield**. *Emergency Medicine Australasia*, *31*(2), 216–224. Full text

This study evaluated the effectiveness of a flowchart governing ED pulmonary embolism investigation across three EDs in Melbourne, Australia for a 12 month period. Comparison of pulmonary embolism imaging rates and yield with the preceding 12 months was performed. A total of 1815 pre-implementation scans were performed compared with 1116 scans post-implementation. The introduction of a clinical flowchart incorporating Wells score, PERC rule and age-adjusted D-dimer was associated with an increase in ED computed tomography pulmonary angiogram and nuclear medicine ventilation perfusion yield rate from 9.9% to 16.5% across the three enrolment hospitals when investigating possible pulmonary embolism. This corresponded to a 40% relative reduction in pulmonary embolism imaging. Diagnosis rates remained unchanged and no cases of missed pulmonary embolism attributable to the flowchart were identified.

PAEDIATRICS

Imaizumi, M., et al. (2023). **Flowchart for selecting an appropriate surgical airway in neurologically impaired pediatric intubated patients: a case series**. *Brazilian journal of Otorhinolaryngology, 89*(5), 101290. Full text

The objective of this study was to create a flowchart for the selection of a surgical airway for Neurologically Impaired Pediatric Patients (NIPPs). To evaluate the importance of the flowchart a survey of pediatricians was conducted regarding selection of a surgical airway, and we also evaluated the appropriateness of the flowchart among pediatricians and caregivers through questionnaire surveys which include satisfaction with the decision-making process, and postoperative course after discharge. A total of 21 NIPPs with intubation underwent surgery and a total of 24 participants (14 pediatricians and 10 caregivers) completed the survey. The study demonstrated the effectiveness of their flowchart for selecting an appropriate surgical airway in NIPP. By referring to our flowchart, pediatricians and caregivers are likely to be able to select an appropriate surgical airway, leading to increased satisfaction with the decision-making process and postoperative course.

Franceschi, R., et al. (2021). **Failure to thrive in infant and toddlers: a practical flowchart-based approach in a hospital setting**. *Italian Journal of Pediatrics, 47*(1), 62. Full text

By this prospective single-centre study we evaluate the application of a cost-effective flow chart that helps the clinician in a hospital setting discern accurately organic and non-organic failure to thrive in children up to 2 years of age with growth faltering. The pediatricians used a practical flow chart, took the medical history, created a growth chart, performed clinical examinations, and requested blood test and consultations in a step by step approach. The study mostly evaluated the content of the flowchart, however, it was felt that it provided cost benefits by avoiding unnecessary blood test or consultations in most non-organic diagnoses.

IMAGING

Langguth, P., et al. (2021). **Implementing a standardized and symptom-oriented flowchart "Kielsflow" for advanced cardiac imaging in a 24/7 interdisciplinary emergency department using spectral CT**. *Clinical Imaging, 78*, 256–261. Full text

This work focuses on implementing a standardized and symptom-oriented flowchart (Kielsflow) for advanced cardiac imaging in a 24/7 emergency setting using a dual-layer spectral detector CT system. This flowchart was designed to optimize patient management and standardize imaging workflow. The study concluded that KielsFlow is a practical approach based on our long-term experience with different cardiac CT examinations/patients in our interdisciplinary ED. Indeed, and as its main strength, clinical personnel without advanced experience in cardiac CT imaging can perform standardized and symptom-oriented cardiac CT examinations with KielsFlow in emergency settings, potentially reducing the number of inadequate examinations and inconclusive decisions. Thus, using KielsFlow radiologists and technologists can perform symptom-oriented and personalized cardiac CT examinations by creating spectral images adapted to clinical questions. Notably, the idea of KielsFlow can be transferred to other vendors for improving patient management and cardiac CT diagnosis in EDs, independent of the level of the knowledge of clinical personnel concerning cardiac imaging.

Woitek, R., et al. (2017). **A simple classification system (the Tree flowchart) for breast MRI can reduce the number of unnecessary biopsies in MRI-only lesions**. *European Radiology, 27*(9), 3799–3809. Full text

The objective of this study was to assess whether using the Tree flowchart obviates unnecessary magnetic resonance imaging (MRI)-guided biopsies in breast lesions only visible on MRI. Methods: This retrospective study evaluated consecutive suspicious (BI-RADS 4) breast lesions only visible on MRI that were referred to our institution for MRI-guided biopsy. All lesions were evaluated according to the Tree flowchart for breast MRI by experienced readers. The Tree flowchart is a decision rule that assigns levels of suspicion to specific combinations of diagnostic criteria. In

conclusion, this study showed that the Tree flowchart, with a cut-off value of ≤2, can reduce the number of biopsies in MRI-only lesions by as much as 27.8%, with no false negative cases, thus potentially decreasing healthcare costs and patient discomfort.

SURGERY

Sun, Q., & Sun, C. (2023). **Effect of emergency flow chart on rescue effect of surgical critically ill patients**. *Minerva Surgery, 78*(3), 313–315. Full text

This letter to the editor discusses the effect of an emergency flowchart on rescue of critically ill surgical patients. ..The introduction of emergency flow chart realizes the standardization and procedure of the workflow of hospital emergency surgery, effectively improves the probability of successful rescue of patients, and optimizes the work efficiency of hospital emergency surgery. Hospital emergency surgery in the rescue of critically ill patients with the use of emergency flow chart, can effectively improve the success rate of patient rescue, while shortening the average level of patient rescue time. Medical staff have a clear understanding of their responsibilities and positions, and they can also have a clear understanding of the work that needs to be done in the face of various emergencies in emergency surgery, even if the patients are emotional and show uncooperative behavior. The flowchart can ensure the smooth progress of the rescue process.

Mejri, A., et al. (2022). **Gastrointestinal perforations by ingested foreign bodies: A preoperative diagnostic flowchart-based experience. A case series report**. *International journal of Surgery Case Reports, 95*, 107216. Full text

This paper aims to present our preoperative diagnostic flowchart and describe the surgical management in a Tunisian center. A retrospective review of 48 patients with gastrointestinal perforation by ingested FB treated in the surgery department. All patients underwent open surgery after a median time of 7.12 h. This duration decreased after applying the flowchart (8.21 h versus 5.6 h). The study found the diagnostic flowchart effective in reducing delay in surgery and it seemed to improve preoperative diagnostic accuracy.

Prkić, A., et al. (2019). **How Well do Orthopedic Surgeons Recognize Different Models of Total Elbow Arthroplasties on Plain Radiographs with the Use of a Diagnostic Flowchart?**. *The Archives of Bone and Joint Surgery, 7*(5), 407–415. Full text

Recognition of total elbow arthroplasties (TEAs) on plain radiographs is difficult due to a multitude of different types and models. Especially if surgery reports and documentation are not available, lost or when the primary surgery was performed in another hospital the prosthesis type may be undeterminable. Therefore, we investigated in this platform study if a flowchart aids in recognition of thirteen different total elbow arthroplasty models on plain radiographs. Ten orthopedic surgeons specialized in upper extremity surgery completed the study. Recognition rates of the thirteen total

elbow arthroplasty models ranged between 20 and 100 percent without the flowchart. Using the flowchart recognition varied between 40 and 90 percent. In general, however not significant, the flowchart increased correct recognition rates and inter-observer reliability. Therefore, we do encourage use of the flowchart to aid in determining unknown total elbow arthroplasty models.

Som, R., et al. (2010). **Flow charts improve efficiency and education during bilateral complex reconstructive surgery of the breasts**. *Plastic Surgical Nursing, 30*(4), 219–225. Full text

Free flap surgery for breast reconstruction using abdominal, gluteal and thigh perforator flaps is now routine, however demanding, especially when performed at the same time as the mastectomy. For healthcare staff new to bilateral immediate reconstruction-be they scrub nurses, technicians, junior doctors, or anesthetists-the operative process is not only lengthy but also confusing because it involves multiple steps and operating theatre teams. To simplify the process, we have designed flow charts that map out the course of the operations. We have found that these pictorial representations not only educate staff but also increase the efficiency of the entire procedure. This general principle of utilizing a flow chart to outline complex surgery can be applied to many different types of operations besides breast reconstruction.

APPENDIX

SEARCH METHODOLOGY

A systematic search was conducted for literature. The results were screened by librarians using Covidence.

SEARCH LIMITS

- English-language
- Published from 2010 onwards

DATABASES SEARCHED

- Medline – index of peer reviewed articles across health sciences and medicine.
- Embase – index of biomed and pharmacological peer reviewed journal articles.
- Emcare – index of nursing, allied health, critical-care medicine and more.
- SCOPUS – index of scientific, technical, medical and social science literature.
- Grey literature – Google, Google Scholar, Trip database, DuckDuckGo.

ADDITIONAL SEARCHING

- Forwards and backward citation searching was undertaken for following articles.
    - O'Leary, M. C., et al. (2023). **Optimizing process flow diagrams to guide implementation of a colorectal cancer screening intervention in new settings.** *Cancer Causes & Control, 34*(Suppl 1), 89–98.
    - Colligan, L., et al. (2010). **Does the process map influence the outcome of quality improvement work? A comparison of a sequential flow diagram and a hierarchical task analysis diagram.** *BMC Health Services Research, 10*, 7.

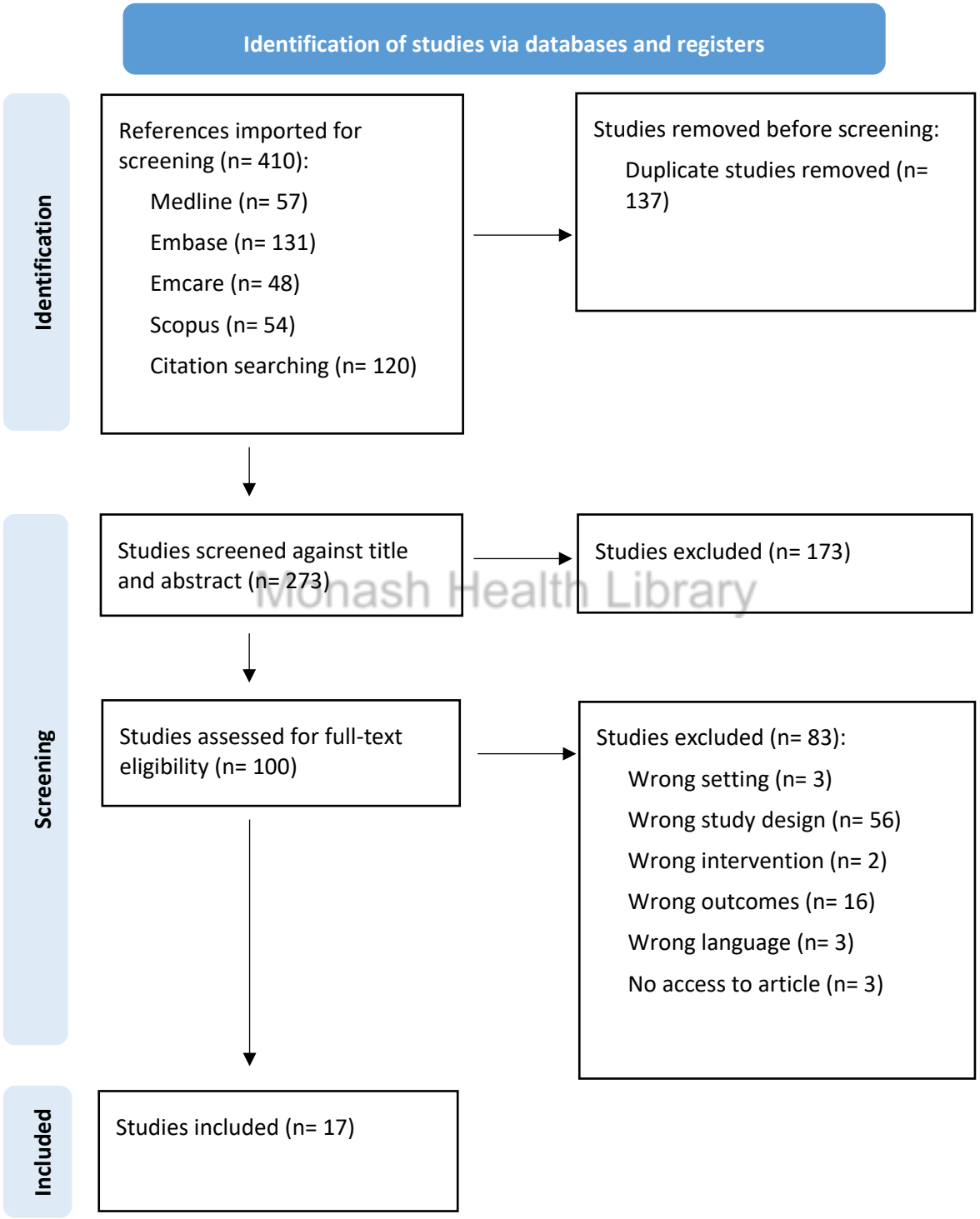
MEDLINE SEARCH STRATEGY

This search strategy was conducted on 12/01/2026 and translated to other databases, as relevant. Searches in each database were conducted on the same day.

Ovid MEDLINE(R) ALL <1946 to January 12, 2026>

1 (Flowchart* or flow-chart* or flow chart* or flow diagram*).ti. 506
2 (Hospital* or care service* or care facilit* or health facilit* or support service* or support facilit* or unit*).mp. 4401037
3 exp Hospitals/ 338994
4 2 or 3 4410580
5 1 and 4 99
6 limit 5 to yr="2010 -Current" 57

PRISMA CHART



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