Emergency Medicine Documentation Template   
Evaluation Plan

Version 2, 10/18/19

The purpose of this plan is to outline a set of assessments to evaluate the utility and usability of a new CPRS documentation template for Emergency Medicine (EM).

# Summary and Introduction

The primary goal of the Emergency Medicine National Documentation Template project is to design and implement a national clinical-reminder dialog-template to improve and standardize the clinical documentation of Emergency Medicine (EM) visits.

The secondary goal for this project is to pilot a process from the Usability Toolkit project for applying human-centered design to the configuration of VA health information systems (HIS); this approach was intended to:

* Promote the specification of usability objectives by the national program office and by users at pilot site VAMCs.
* Produce an evaluation strategy for assessing usability at various points across the HIS configuration lifecycle (development, HFE testing, IOC testing, and implementation).
* Inform development of a robust method for evaluating clinical decision support interventions.
* Drive contextual analysis and evaluation planning from a customer-perspective value proposition.

## Guiding Evaluation from Project Value Proposition

One hypothesis from the Usability toolkit project was that a simple, guided value proposition could help frame project goals and objectives in a way that supports easy extraction of key usability concepts and a direct connection to driving business goals. For example, an accurate value proposition would describe the problem, costs of the problem, key users and stakeholders, tasks, success measures, and other context of use information. The value proposition for the EM template project is included in Appendix A.

## Documentation Templates as a Form of CDS

Smart documentation templates go beyond simple data entry forms by providing decision support as a primary goal. They:

“Provide complete documentation for care quality/continuity, reimbursement, legal requirements; reduce omission errors by displaying items for selection; reduce commission errors by ensuring critical data—such as allergies—are captured; provide coded data for other data-driven CDS. Provide prompts to acquire specific information in the format desired (for example, displaying “kg” for weight to ensure capture in the metric system as needed for subsequent dose calculation).” (AHRQ, 2019)

As such, smart documentation templates require decision support evaluation in addition to typical usability evaluation.

## Guiding Evaluation from CDS Impact General Model

VA Knowledge Based Systems (KBS) proposed a model for framing and understanding CDS tools, called the General Model (VA 2017). The General Model uses a table format to extend the widely-used 5-Rights framework, adding Process and Patient outcomes to the right information, person, time, channel, and format. The General Model also adds four measure types (effectiveness, safety, efficiency, and satisfaction) across which each of the seven core measures may be assessed, resulting in a 7x4 table of specific measures. The table contents will vary depending on the specific type of CDS being evaluated. A table for the EM template is included in Appendix B.

## Guiding Evaluation from Stakeholder Observations and Interviews

The project team conducted a site visit to verify working assumptions regarding context of use for emergency medicine documentation templates. The team interviewed multiple stakeholders, template users, and documentation recipients to better understand how each perspective might best determine how template and subsequent documentation content is used, identify pain points regarding current usage that had not been expressed, and elicit unidentified design goals by which stakeholders will judge new template success.

# Application Description

## Emergency Medicine Tasks

The American College of Emergency Physicians defines the practice of emergency medicine as “initial evaluation, diagnosis, treatment, coordination of care among multiple providers, and disposition of any patient requiring expeditious medical, surgical, or psychiatric care” (ACEP, 2015). A simplified list of tasks includes:

* Patient assessment
* Order and interpret diagnostic tests
* Order and interpret consultations
* Determine disease diagnosis
* Order and assess treatment
* Determine patient disposition
* Document patient encounter

The primary goal of the EM template is to directly support EM clinicians in the documentation task. Secondarily, the EM template also supports all of the other tasks through, for example, decision support for diagnosis and disposition and as a prospective memory aid for working through the care process. A tertiary goal is to support recipients of the care documentation for follow-up care and other non-clinical functions.

## EM Task Strategies

Two distinct strategies were identified for completing the documentation task:

* Document-As-You-Go (DAYG) – start the note at the beginning of the encounter and add information to it incrementally as other clinical tasks are started or completed.
* Document at End-Of-Visit (EOV) – note may be started at any time, but most information is added only at the end of the encounter.

The EM documentation template is intended to support both task strategies.

## EM-Template Interaction-Modalities

Two main interaction modalities are used to complete the documentation task:

* Typing – the clinician types information into the template or note
* Speech – the clinician speaks information into the template or note

A third modality, direct manipulation (e.g. “point-and-click”), is used to varying degrees with both of the main interaction styles when necessary user actions are not well-supported with the preferred modality (such as interaction with drop-down menus).

## Strategy Interaction Matrix

Together, the task strategies and interaction modalities represent a representative range of individual differences that should be assessed to validate design objectives. The following matrix represents criteria for recruiting EM participants:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Task Strategy** | |
|  |  | *DAYG* | *EOV* |
| **Interaction Modality** | *Typing* |  |  |
| *Speech* |  |  |

Initial assessments should be used to determine whether the target template is adequate or can be made adequate for end users who prefer to enter their notes via speech.

## Emergency Medicine Documentation Information Flow

EM care documentation is synthesized by the EM clinician from multiple information sources into the EM note using the EM documentation template, irrespective of the documentation task strategy or interaction modality used. The EM note is stored within the patient record for use by secondary and tertiary stakeholders and users. Secondary users include:

* Primary Care Physicians following up on discharged patient
* Hospitalists admitting a patient from EM

Tertiary stakeholders use the EM note for billing, patient safety review, medico-legal review, and other non-clinical tasks. Tertiary users include:

* Medical coders coding the encounter for billing purposes
* Patient safety managers following up to reduce or prevent adverse events
* Risk managers following up on medico-legal issues that may result from an encounter

## Emergency Medicine Workflow

The EM documentation template is designed to support the clinical documentation task of multiple types of clinical users (e.g. physicians, physician assistants, nurse practitioners, etc.) in multiple possible environments (emergency department, urgent care, fast-track). Although there is likely some variation in exact workflow, the normative workflow includes an iterative assess-test-treat loop leading up to the final diagnosis determination and disposition decision. A normative To-Be workflow that the EM template is intended to support is included in Appendix C. Although the included workflow represents a DAYG task strategy, the EOV strategy is also supported as a special case where the bulk of the clinical information is entered at the end.

## Emergency Medicine Documentation Template

The EM documentation template was designed to support a complete, accurate, and succinct record of emergency medicine care for a single patient encounter. It was designed primarily by the three senior emergency medicine physicians on the project team using a content document representative of their collective experience. The content is divided into logical sections reflective of key information resulting from the core care tasks listed earlier, including:

* Header and patient information
* History of present illness
* Patient history
* Review of systems
* Physical exam
* Medical decision-making
* Assessment and Plan
* Disposition

The template was designed using CPRS Clinical Reminder Dialog Template functionality. Within this functionality, templates are used for structured data entry exactly once, after which the template content is transformed into a plain text document. Templates are modal, cannot be saved and reopened, and only one template may be open at a time. This represents a key technical limitation for the use case where a single EM clinician is treating multiple patients concurrently while using the DAYG strategy. A modular version of the template was designed separately to support the DAYG strategy where content sections may be dragged into a text document for completion and editing. The two versions of the template are otherwise equivalent in terms of content:

* Modular template – supports DAYG strategy
* Full template – supports EOV strategy

Although using the modular template has some risks, such as documenters not including all modules in their note or modifying the order of module inclusion, it is also possible for Full Template users to edit out sections that would render them incomplete.

## Template Design Objectives

The template design objectives to be evaluated were drawn from the Value Proposition and verified by direct observation and interviews during the site visit. They can be categorized according to the principal user type of the note content at each stage of the information flow. Those objectives with the most support are listed below within broader evaluation categories:

* **Efficiency of Note Creation**
  + Supports ease of use and efficiency
  + Supports variation in acceptable documentation styles
  + Provides a consistent, final list of ED medications received
  + Outputs a note that is not (unnecessarily) excessively long
* **Sufficiency of Note Information Content**
  + Support workload capture/effective coding
  + Supports medicolegal protection
* **Effectiveness and Efficiency of Note Output for Communication (assuming minimal sufficiency)**
  + Supports effective communication to other health providers and staff (supported examples are outlined in the attached)

Strategies for evaluating these design objectives are described in the next section.

# Evaluation Strategy

## Method to Evaluate: Efficiency of Note Creation

### Approach

Efficiency of note creation for the target template should be compared to extant templates. It is important that note content and quality be controlled between experimental conditions.

Measures of interest:

* Efficiency of template interaction (speed of entry, accuracy of entry, adequacy of template to document clinical information)
  + can be measured by timing data entry using standardized patient cases
  + can be measured per module
  + subjective satisfaction can be measured using CSUQ
* Efficiency of note editing (necessity for subsequent note edits, speed of making all necessary edits)
  + more prone to individual preferences – need standardized participant instructions
  + can be measured using standardized patient cases
  + some amount of editing may become apparent to user only after all modules are completed

### Participants

Emergency medicine physicians, physician assistants, and nurse practitioners who are responsible for providing and documenting patient care are the intended end-users of the EM documentation template. However, initial assessment using non-providers (even non-clinical personnel) participants will likely be sufficiently informative for basic to evaluate basic data entry usability.

### Apparatus and Materials

Any workstation with a CPRS test account can be used. The target template must be loaded onto the account. Any test patient will likely be sufficient.

Experimenter should base the experimental scenario on one of the more complex scenarios already completed. The goal is to create an experimental scenario that exercises all key components of the template. For the modular version of the template, separate data entry tasks can be created by dividing the experimental scenario into information specific to each module. Experimenter should conduct a walkthrough with an appropriate EM SME using the experimental scenario or experimental tasks to ensure creation of a complete and accurate note. The information necessary to document the experimental scenario should be written out in order of entry, and labeled by template field, for participants to use as a guide.

### Procedure

Each participant will be instructed to use the template to enter the prepared data as quickly and as accurately as possible. Measures include completion time, error rates, and subjective satisfaction. Because template use is only part of the documentation process, experimenters may be able to measure separately initial data entry time into template and subsequent editing required after initial data entry. This will help assess sufficiency of support for note creation versus note creation without a template.

A more subtle assessment could also tease out how well the template supports clinical decision-making by the note creator – participants in this case would need to be EM providers and possibly would be most relevant for DYAG task strategy. Questions to ask include:

* Does template use support clinical decision-making regarding final diagnosis, formulation of a treatment plan, or patient disposition?
* Does template use support selection of appropriate medications for the patient?
* Does template use support the participant’s prospective memory (remembering steps, order of actions, outstanding issues, clinical protocols, etc., especially when treating multiple patients concurrently)?

## Method to Evaluate: Effectiveness and Sufficiency of Note Information Content

Our primary questions here are:

* Does the resulting note contain sufficient information to support subsequent tasks?
* Specifically, does the resulting note support fast and accurate medical coding?
* Does the note allow pharmacists to unambiguously understand which medications the patient was given and what was ordered?
* Can patient safety and risk management staff sufficiently understand the encounter to identify and prevent patient harm?

### Approach

Measures of interest:

* Adequacy of note content for note recipients to successfully complete their tasks (coders, primary care, hospitalists, risk/quality/safety reviewers) (description of recipient needs is intentionally simplistic and need to be refined)
  + coders and reviewers need to determine what was done during ED encounter, does documentation support E&M code, verify the template is a job aide and not “steering” providers – evaluate using coding worksheet and by review of template
  + primary care wants to determine what needs to be done next to follow up – evaluate using expert review
  + hospitalist wants to continue or formulate new treatment plan  - evaluate using expert review
  + EM provider wants to know if related to previous ED visit - can evaluate with expert review using Lexington ED Internal Quality Assurance Review Sheet
* Effectiveness of note content to convey necessary situation awareness (speed of understanding, completeness of understanding) – evaluate using SAGAT or scenario-based test (e.g. what is the most critical patient issue?, what do you do next?) using template-generated note from standardized cases
* Amount of information stored as structured data (using terminology or other VA standards)
  + unclear what this will entail until after terminology review during national template process

### Participants

Each role that uses the patient note for subsequent tasks must be assessed to ensure sufficiency of the note content. Participants should vary in terms of their experience. Participants should include at least:

* EM Providers – When a patient returns to an emergency treatment facility, providers need to understand the context surrounding the patient’s previous visit.
* Hospitalists and Primary Care Providers – When patient care is transferred outside of the ED, either through discharge or inpatient admission, physicians need to determine what treatment was provided, , whether the results of any tests were left unanswered, whether the EM-proposed treatment plan is still appropriate and what else, if anything, needs to be done regarding patient care.
* Medical Coders - Coders need to determine what was done during ED encounter and whether the documentation in the note supports the chosen E&M code.
* Patient Safety and Risk Managers – when risk of patient harm is indicated (such as when the patient is discharged against medical advice), staff may be required to review and understand the care episode to mitigate that risk.

### Apparatus and Materials

Testing should occur within the apparatus or system used for the primary tasks of the participants. For example, assessing information adequacy for the medical coding task should be conducted by observing medical coders using the coding software. If possible, experimenters should use CPRS to replicate real-world conditions. However, for participants who do not require specialized software (i.e., participants other than medical coders), a paper printout of assessment materials should be adequate.

Materials should consist of at least six components:

* A set of detailed scenarios customized for each participant type, such as “Your patient was treated in the ED over the weekend and has come in to follow up…” These scenarios must be crafted to include contextual information known to contribute to care transfer confusions, such as a lab culture whose results were unknown to the EM provider.
* A set of patient cases to drive each scenario, including at least one simple case and one complex case.
* A set of experimental scenarios (with much detail removed) to guide the participant in performing their primary task.
* A set of questions that a well-informed recipient should be able to answer. An EM expert must help craft a series of questions and/or information that a note recipient must know to provide adequate follow-on care; this should be done without looking at the actual note, as this may bias the questions.
* A set of answers that a well-informed recipient should be able to provide. In the case of medical coders, this would consist mainly of an accurate coding worksheet and any issues that a diligent coder would need clarified to complete coding.
* A set of representative notes that support each scenario must be created to serve as input for the experimental task or scenario. For example, the note that results as output from the Note Creation assessment could be used as the input for this assessment. If necessary, a walkthrough by an EM expert may be required to create such a note. To avoid bias, the EM expert who creates the note should not be the same expert who created the questions.

The combination of experimental scenario, patient case, and input note should represent ground truth for participants. Because the target of the assessment is the note as output from the template, it is important to note that we are not assessing the scenario, the case, or the participant’s skill – we are only trying to assess the adequacy of the information contained within the note.

### Procedure

Participants should be instructed to perform the experimental task as accurately as possible, without regard to time. The experimental task will vary according to the corresponding primary task of each participant role. Participants should be presented with the general scenario and the associated note. If necessary, participants should be given access to the patient case information (such as history, demographics, or medications that may not typically be included in an EM note). Participants should then be asked to perform their task or to answer questions to assess their situation awareness resulting from the information in the note. Experimenters can use a think-aloud protocol to identify confusing information, as task time is not a factor. General questions to ask (which may be included in the set of expert questions) include:

* Does the note make sense overall? If not, what questions do you have?
* Does the final diagnosis make sense? Is it adequately supported by the note?
* Does the patient disposition make sense? Is it adequately supported by the note?
* What needs to be done next in terms of patient treatment?
* What would you look for in the patient physical exam?
* What questions for the patient does the note suggest?

The goal with answering questions is to assess the adequacy of the information contained within the note. Questions should be phrased so as not to imply judgement on the participant. Participant answers and work-products should be compared to expert-prepared answers and work-product (e.g. a coding worksheet).

## Method to Evaluate: Efficiency of Note Output for Communication

### Approach

After determining sufficiency of note content, efficiency of communication of using the new note format can be assessed relative to notes created using the As-Is system. The experimental goal is to understand whether the new note can quickly convey situation awareness and whether that awareness is accurate. Measures of interest:

* Efficiency with which readers can find necessary information (formatting, order of presentation, amount of visual noise) – evaluate using task-based timed testing using template-generated note from standardized cases
* Subjective preference regarding order, format, and any unnecessary content contained (e.g. data noise)

### Participants

Same participant types used to assess information adequacy (see section 3.2.2).

### Apparatus and Materials

Same apparatus and materials used to assess information adequacy (see section 3.2.3).

### Procedure

Participants should be instructed to perform the experimental task as quickly as possible. This instruction is important for both measuring the time to understand the note content, as well as, uncovering confusing format or wording issues that are not detected when time is not a factor.

# References

AHRQ, 2019, retrieved on 9/27/19 from

[https://healthit.ahrq.gov/ahrq-funded-projects/current-health-it-priorities/clinical-decision-support-cds/chapter-1-approaching-clinical-decision/section-4-types-cds-interventions](about:blank)

ACEP, 2015, retrieved on 9/27/19 from [https://www.acep.org/patient-care/policy-statements/definition-of-emergency-medicine/](about:blank)

Appendix A: EM Value Proposition

# Project Goals and Intended Outcomes: EM National Template

**Purpose:** *This document helps specify the business or clinical drivers behind this project. Although the questions may seem “obvious”, the answers are essential to determining many aspects of design, including usability objectives. It is important to keep the answers as concise and focused as possible. When listing items, try to place them in priority order.*

1. What is the problem that the project is intended to solve?
2. Lack of standardization of clinical documentation leads to inconsistent data in the patient record; this leads to inefficiencies in accessing needed data and inefficient communication across care team. Most notes written in boiler template format. Clinical reminder dialogue would allow for data mining, trending, and national comparison.
3. Current templates lend themselves to inaccurate documentation. For example, templated normal exams may include components that were not actually done.
4. Who does the problem affect and how is it quantified?
5. Lost revenue due to poor workload capture.
6. Lost revenue due to inefficiencies of care (unnecessary or redundant care).
7. Potentially poorer patient outcomes due to sub-optimal communication between providers and services.
8. Current documentation does not protect the provider medicolegally. For example, many current notes lack a “Medical Decision Making” component making it difficult to defend in peer review or malpractice claims.
9. What is currently done and why is it not good enough?
10. VAMCs use local templates with wide variability in workload capture, codability, user friendliness, usefulness to subsequent readers of the note.
11. Because of non-standard documentation:
    * It is more difficult to find patient/treatment information afterwards.
    * It is impossible to apply automation to some information.
12. Clinicians will copy and paste notes.
13. Even at sites where templates are used:
    * Some clinicians resist templates because they are too time consuming, difficult to use, or do not support variations in clinician documentation styles.
    * Those templates may not have been tested for optimal user efficiency, effectiveness, safety, and document standardization.
14. What is the proposed solution?
15. Develop a national clinical reminder template that:
    * Meets national standards for patient care.
    * Supports the standardization of clinical data.
    * Is sufficiently customizable to meet the demands of local VAMC workflow.
    * Is flexible such that clinicians do not have to fill out unnecessary information / minimize data entry.
    * Accommodates differences in acceptable documentation styles.
    * Pulls information from the patient record needed by the clinician at the point of care.
    * Has been tested for usability and safety.
    * Is adaptable to sites with urgent care centers versus full-service emergency departments.
16. What steps are planned to achieve this solution?
17. Analyze existing exemplar templates.
18. Develop template requirements (functionality, performance, data standards, usability).
19. Prototype new template (what was the basis of the design).
20. Test and improve usability of the prototype.
21. Train clinicians on use of template.
22. Deploy to field.
23. Track adoption, usage, data quality, outcome measures, and revenue improvement.
24. How will project success be defined or measured?
25. Template adoption rates.
26. Increased patient throughput.
27. Reduced clinician time spent on documentation.
28. Quality of resulting notes.
29. Standardization of resulting notes.
30. Improved physician satisfaction.
31. Improved patient satisfaction.
32. Improved patient outcomes.
33. Reduced adverse events.
34. Reduced peer review and tort claims.
35. What are the benefits of a successful conclusion?
36. Improved patient outcomes.
37. Increased revenue.
38. Improved physician satisfaction.
39. Improved trending of emergency department care.

Appendix B: CDS Impact General Model Applied to  
Emergency Medicine Documentation Template

(DRAFT)

(NOTE: This table is notional and requires further analysis and elaboration)

The General Model is intended to serve as a guide for CDS designers and evaluators. It extends the 5-Rights model by adding outcome factors to better reflect the broader effects of the CDS on patients and broader care team. The additional factors are shown as the rows titled, Patient or Population Outcomes and Process or Organizational Outcomes. For each of the core factors, multiple dimensions can be considered, such as effectiveness, safety, efficiency, and subjective satisfaction. Each cell within the table may refer to multiple specific factors or measures for evaluators to consider. In some cases, design constraints may obviate the need for a particular row, for example, when organizational system constraints dictate the CDS channel to be used.

Effectiveness and safety are two sides of the same coin – any tradeoff involving one will typically affect the other. For this reason, the dividing line between Effectiveness and Safety is dashed (figuratively, the line is often blurred). However, there are often considerations for evaluation that are clearer when the columns are considered separately.

Applying the model to different CDS types will necessarily result in different factors reflected in the table cells – each type of CDS has somewhat unique properties that determine its successful application. Likewise, the context of CDS application will also determine variation in the table, as various constraints and context of use factors may raise or negate specific evaluation measures.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | Effectiveness | Safety | Efficiency | Satisfaction |
| Right Information Presented to End User | Patient information is auto-populated (e.g. surgical history)  Documentation task is driven by chief complaint  Template supports learning for new users |  | Template language is concise and understandable  Template prevents redundant documentation |  |
| Right Person to Receive Intervention | N/A – user selects intervention | N/A | N/A |  |
| Right Time in the Workflow | Template supports document-at-end and document-as-you-go task strategies |  | Modular template notes can be resumed after task interruption |  |
| Right Channel (Device) for Delivery | N/A – CPRS is the predetermined channel for delivery | N/A | N/A |  |
| Right Intervention Format | Supports medicolegal protection |  | Supports multiple interaction styles (typing, speech)  Supports variation in documentation style (amount of free text)  Supports efficient documentation task completion |  |
| Patient or Population Outcomes | Note output accurately reflects encounter  Note output supports accurate follow up care. | Note does not hide critical information for follow up care. |  |  |
| Process or Organizational Outcomes | Supports accurate workload capture |  | Does not reduce patient throughput in clinic. |  |

Appendix C: EM To-Be Workflow  
Document-As-You-Go Strategy

/Volumes/Odin/Research/KBS/Projects/Usability Toolkit/EM Example/Workflow/ED Workflow To-Be DAYG v3.pdf