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Massachusetts Hospital CPOE Initiative

Draft CPOE Standards

October 2005



Requirements for a Successful CPOE Implementation
Massachusetts Technology Collaborative and New England Healthcare Institute

Functional Requirements for a Successful CPOE Implementation
Massachusetts Technology Collaborative and New England Healthcare Institute

These standards were developed for use in a vendor RFP for the MTC/NEHI CPOE initiative in Massachusetts. The intent was to define requirements for physician acceptance, implementability, and achieving value that differentiate vendor solutions in significant ways. Requirements are organized into three categories:

- A. Physician Acceptance – system features that make it easier to present a user-friendly, highly functional, and valuable tool to physicians.
- B. Implementability – system features needed to roll out CPOE throughout the hospital with the necessary support to order management and related processes, interoperability with other computer applications, and with support meeting regulatory requirements such as HIPAA, JCAHO, etc.
- C. Value – system features needed to utilize clinical decision support tools in CPOE as part of ongoing efforts to improve the quality, safety, and cost effectiveness of inpatient care

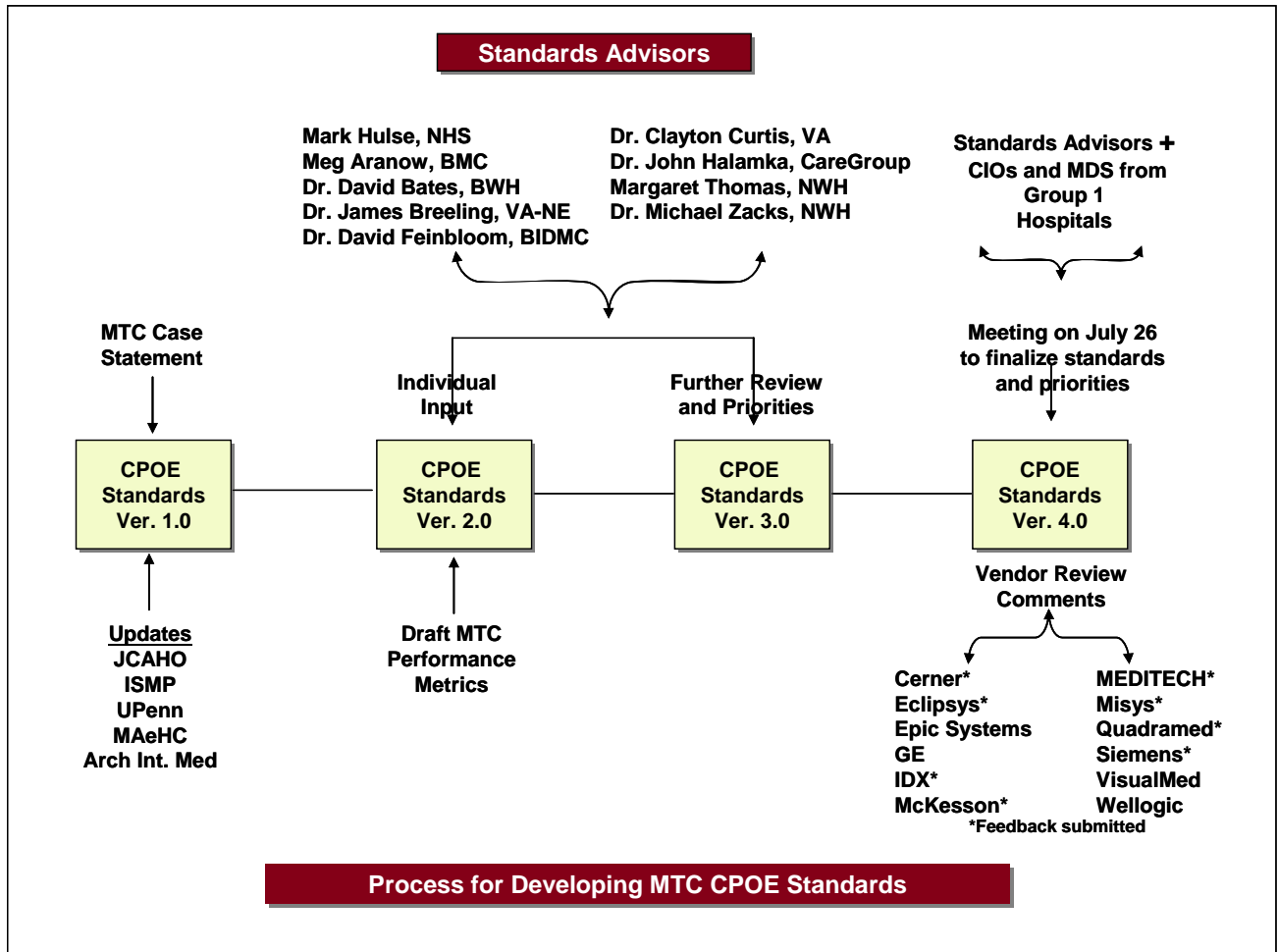
A group of expert advisors in Massachusetts developed the standards in the multi-step process depicted below. Advisors included CIOs and physicians who have developed CPOE applications, implemented commercial CPOE solutions, and researched the need for, and effectiveness of decision support tools to improve quality and safety.

- *Essential Now* (E-N) – must be included in CPOE application rolled out to be successful.
- *Essential Future* (E-F) – not as critical for initial implementation, but will be required in the future.
- *Desirable* (Des) – not absolutely essential for success, but increases the chances of success with physician acceptance, house-wide implementation, or achieving significant gains in quality and patient safety

One critical requirement for success with CPOE is usability because it determines how much effort physicians must invest in learning how to write electronic orders and the time to accomplish this task. The advisors have included some features that contribute to usability in the standard, but recommend demonstrations to evaluate usability more completely.

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08/27/05 (incorporating clarifications suggested by vendors and advisors and priorities established by advisors).

A. Physician Acceptance

Requirement	Description	Implications	Priority
A1. Design of order screens and data entry for complex orders	Complex orders for some medications and other services require specialized designs to accommodate the content.	The design approach taken influences how much effort is required to learn and use the system to write actionable orders. It also determines whether it is possible for physicians to write all of their orders using CPOE. Without specialized support, physicians are required to resort to free text, which a human needs to interpret.	
A1a. Complex sig	Specialized design to accommodate a complex order such as one with dose based on physical status (sliding scale) and multiple daily doses of different types specified in the same order.	Physician can convey all of the necessary information clearly in a single order (e.g., insulin, heparin)	E-N
A1b. Taper dosing	Specialized design to accommodate dosing adjustments in a single order from the physician perspective (e.g., steroids)		E-N
A1c. Titrating dose	Specialized design to accommodate the instructions the physician needs to convey in the order as a function of patient attributes or status		E-N
A1d. TPN	Specialized template to accommodate order the way a physician writes TPN orders	Even if physician does not write TPN orders, they need to be accommodated.	E-N
A1e. Patient-controlled analgesics	Specialized template to accommodate necessary dosing limits and instructions		E-N
A1f. Dosing expressed as weight-based and BSA-based	Ability for physician to specify dose by product as a function of weight or BSA and for the dose to be automatically calculated based on known patient data.	Especially important for pediatrics. Important to display parameters used in calculation.	E-N
A1g. Blood products	Specialized template to accommodate the instructions the physician needs to convey in the order		E-N
A1h. Restraints	Specialized template to accommodate the instructions the physician needs to convey in the order	JCAHO requirements for documentation accompanying orders for restraints	E-N
A1i. Two-party orders	Design that accepts physician-appropriate input and holds order in an incomplete status until completed by an authorized user from nursing or an ancillary department	Some orders for medications ("pharmacy dosing"), certain diagnostic procedures (laboratory, radiology), require input from a second user before the order is actionable.	E-N
A1j. Intravenous admixture-custom	Specialized template that allows physician to express dosing w/o requiring details about preparation that are the responsibility of pharmacy		E-N
A1h. Free-form order for miscellaneous items	Ability to enter <i>miscellaneous</i> care orders that don't fit typical categories or templates (e.g., patient needs a special mattress)	Needed for CPOE to capture all physician orders	E-N

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Requirement	Description	Implications	Priority
A2. When writing orders, ease and speed of locating those of interest for each patient	Options are available for the physician to locate and call up individual and groups of orders in different ways.	The effort physicians must expend locating orders in the system contributes to the time required for writing orders.	
A2a. Ability to select patient of interest from lists based on relationship with patient	Patients on this unit, current inpatients for whom physician is attending, has written orders, or is a consultant. Options may include team/group and coverage.	Speeds patient identification for physicians and assists with identifying right patient	E-N
A2b. Frequently used orders and order sets	A short-cut to the orders/order sets a physician uses frequently—typically customized by the institution	Speeds up locating orders and order sets	E-N
A2c. Departmental frequently used (orders and institutional order sets)	Access distributed based on lists created by the institution for each clinical department		E-N
A2d. Diagnosis- and condition-specific order sets	Selection based on diagnosis or condition	Another means for locating orders	E-N
A2e. Use of type-ahead, "starts with," or other quick means to specify orderable item of interest	In response to user entry, display of possible orders that match type-ahead or other means for narrowing possible orders with a small number of keystrokes	Avoids the need to search in choice lists	E-N
A2f. Ability to map multiple short names to same orderable item	Includes ability to convert to, and retain as a preferred institutional term.	Supports broader range of short names in conventional use	E-N
A2g. Ability to attach text instructions to a short name for an orderable item	Notify physicians when naming convention changes or a new intervention becomes available	Tool for notifying physicians that the name applied to a test or other intervention has changed or they may want to consider ordering a newly available intervention instead	Des
A3. Ability to accommodate all order types	All types of orders – including laboratory, radiology and pharmacy can be generated using the same orders module <i>and order sets</i> .	Extra navigation and orders that don't always appear the same add to lack of intuitiveness of electronic order entry and time to accomplish ordering.	
A3a. Different order types can be selected and entered for a patient w/o requiring knowledge of the order type or special navigation	All ordering for patients occurs seamlessly for the physician (i.e., doesn't require selecting another order type or entering another module)		E-N
A3b. Complex orders with specialized designs can be incorporated into order sets	All of the order types in A1 can be incorporated into order sets.	Necessary to fully leverage order sets as a tool for reducing undesirable variation	E-N
A3c. Orders incorporated into order sets appear the same as individual orders for the same intervention	From the physician perspective, orders for a particular intervention always look the same whether ordered individually or as part of an order set.		E-N
A4. Communication and information management	Design that organizes communications so that physician can easily identify and attend to outstanding <i>tasks</i> by type, by patient, by urgency.	For physicians, an important part of the value proposition for doing electronic ordering is assistance with handling patient management and communication tasks. Avoiding gaps in communication and delays in response also enhances safety and quality.	
A4a. Workflow management for communications	Inbox or other design for organizing and tracking pending laboratory test results and other communications regarding patients	Physician is assisted in knowing what needs to be reviewed	E-N

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Requirement	Description	Implications	Priority
A4b. Flagging of communications regarding urgency	Designation of communications based on urgency or responding (e.g., abnormal laboratory test results)		E-N
A4c. Workflow management for patient-related outstanding tasks	Ability for physician to view pending tasks for each patient (e.g., outstanding alerts, consultation reports) as an aid to organizing the work and ensuring there are no loose ends	One design approach is an annotated patient list with designation of the numbers, types, and urgency of pending tasks such as lab results, alerts, expiring orders, orders to sign, etc.	E-N
A4d. Notification of orders to sign	Support to physician in knowing he/she has orders requiring signature		E-N
A4e. Notification concerning patients with expiring orders	Some designation of patients with expiring orders		E-N
A4f. Rounds report summarizing information on current care plan and patient status	Ability to <i>display or</i> print rounds report with current information about each patient (e.g., current meds, labs, vital signs)	A big win with physicians when they prefer a paper view of available information as they make rounds or do sign-out.	E-N
A4g. Ability to view patient information integrated into a flow sheet	e.g., ICU flow sheet with vital signs, med admin, lab tests, etc.		E-F
A5. Ease of navigation		Important to reduce learning and time required to write orders electronically	
A5a. Industry-standard, navigation	Standard GUI navigation, which is familiar to computer users (e.g., user does not have to close pull-down menus or use function keys)	Users familiar with standard applications should not have to relearn basic navigation.	E-N
A5b. Option for mouse-driven navigation as an alternative to keyboard navigation	Ability to offer multiple modes of navigation allows catering to different types of users.	Mouse is a universal interface, preferred by some users.	E-N

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B. Critical CPOE Requirements for Implementability

Requirement	Description	Implications	Priority
B1. Physician portal technology that facilitates universal physician access to CPOE.	System offers a portal that provides a physician-appropriate entry into tasks and data access.	Physicians must be able to access CPOE whenever they are making decisions about their patients – in the hospital, at their office or from home.	
B1a. Single-point access to all supported electronic tasks	Physician can easily navigate across tasks and patients to do their work	Ease of navigation reduces time for training and accomplishing work during user sessions.	E-N
B1b. Includes connectivity for remote access to native form	Physicians can access the familiar functions and look and feel from external locations	Access whenever a physician is making care decisions is a prerequisite for fully leveraging the value of CPOE and other clinical applications	E-N
B1c. Options include Internet access	To facilitate access from home and other remote locations		E-N
B2. Integration with the pharmacy application, enabling the necessary two-way flow of data between the CPOE and pharmacy applications	When pharmacy application is not integrated, it is necessary to ensure that medication orders are seamlessly transmitted from the CPOE system to the pharmacy application so that patient care and pharmacy processes are based on the same information and orders need not be re-entered.	Physicians order medications a certain way, whereas pharmacists often need to process orders and prepare medications for distribution employing different units of measure. Making the necessary translations can be difficult.	
B2a. Physician view based on conventions for dosing		Physicians are not expected to write orders in dispensing units or select products based on dispensable forms	E-N
B2b. Pharmacy view based on units for dispensing			E-N
B2c. Order available electronically to pharmacy application	Real-time electronic transmission to pharmacy application so that re-entry is not required	Re-entry of orders in pharmacy results in delays and potential errors in transcription	E-N
B2d. Physician ability to obtain up-to-date view of medication orders following pharmacist completion or modification	Transmission of update back to physician view for orders completed (e.g., "pharmacy dosing) or approved modification of medication orders	Physician must be able to view actual current medication orders at all times or be made aware of any changes made by pharmacy	E-N
B3. Interoperability with the medication administration record (MAR) application.	Once an electronic MAR is in use, information regarding administration is available to physicians.	Without this interoperability, physicians can't be provided with a real-time view of administration status for their orders with pertinent nursing comments (patient response, vital signs taken at administration, etc.)	
B3a. Ability to view medication administration <i>status</i> as part of patient information on medications	Patient data available to physician for viewing and flowcharting including medication administration times, medications held or not administered.	Necessary for physician to obtain full range of patient information necessary for care	E-N
B3b. Ability to view patient response documented by nurse for medications administered	Physician can view patient response information	Information documented by the nurse as to patient response is important to the physician managing care.	E-N
B4. Ability to offer physicians mobile access	To fully support and encourage physician use, the hospital needs to be able to offer mobile devices to physicians who want mobile access on patient care units.	Mobile computing is a requirement for physician acceptance. The ability to write orders, as well as look at results, on the mobile device becomes essential once physicians are engaged in CPOE.	

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Requirement	Description	Implications	Priority
B4a. Ability to offer multiple options for mobile devices			E-N
B4b. Ability to offer full-function mobile device	Sufficient screen real estate on mobile device to write orders, etc.		E-N
B5. Interoperability with ancillary department systems		Avoids need to re-enter orders with attendant delays and opportunities for error; if two-way, also allows clinicians to check on order status.	
B5a. Order available electronically to departmental application			E-N
B5b. Physician ability to view status of order completion	e.g., films taken, specimen accessioned	Essential for physician to obtain status of test, procedure, or nursing intervention	E-N
B6. Easy access to display of current orders during order writing	Physicians can easily view orders when taking actions regarding orders	Difficulty viewing all current orders was cited as one cause of errors in recent study from UPenn	
B6a. Ability to view current orders of all types in single display	Facilitating access and, to the extent possible, minimizing the need for multiple screens and scrolling		E-N
B6b. Ability to view all current, all current and one-time, all orders			E-N
B6c. Display of all current orders during signing of new orders	Easy access to all current orders		E-N
B6d. On-demand display and printing of patient orders by user-selectable criteria	All current, by category, etc.		E-N
B7. Auto-log-off	Required for HIPAA (patient privacy)		
B7a. Set timing for auto-log-off	Ability to set interval of time without user interaction for automatic log-off		E-N
B7b. Modify timing for auto-log-off for individual devices	E.g., MD office versus public area such as nurses station		E-F
B7c. Auto-save of orders and documentation written, but not signed, upon auto-log-off		Physicians are often interrupted. The ability to pick up computer tasks where they left off is a time-saver.	E-F
B8. Support to medication reconciliation upon change in patient level of care	During patient transfers from one level of care to another, special attention is now being focused on communicating information about medications and allergies because of the importance to safety and quality of care.	JCAHO requirement as to process in 2006; CPOE needs to facilitate and document med reconciliation	
B8a. At admission, ability to document patient outpatient medications and allergies	Documentation of information about active outpatient medications will be mostly manual at present. Sufficient information will not always be available to actually record the full details of the prescription.		E-N

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Requirement	Description	Implications	Priority
B8b. At admission, ability to incorporate and amend outpatient medications from one or more external EMRs while documenting home meds	MAeHC requires <ul style="list-style-type: none"> NCPDP Script for current exchange standard; RxNorm for future NDC for vocabulary 	When information is available from physician office EMRs, it is important to make this information available at admission and easily incorporated into documentation.	E-F
B8c. <i>At admission</i> , ability to incorporate and amend discharge meds from prior admission while documenting <i>outpatient</i> meds	Provide physician with view of discharge medications from prior admission, if applicable, to facilitate assembling list of patient home medications.		E-F
B8d. <i>At admission</i> , ability to <i>view, copy,</i> and amend patient allergy information from one or more external EMRs while performing med reconciliation	MAeHC requires <ul style="list-style-type: none"> HL& version 2.x, AL1 Segment for current exchange standard; HL7 3.0 RIM for future Allows free text for vocabulary 	When information is available from physician office EMRs, it is important to make this information available at admission and easily incorporated into documentation.	E-F
B8e. <i>At admission</i> , ability to <i>view, copy, and</i> amend allergy information from prior admission while performing med reconciliation	Provide physician with information about patient allergies documented during prior admission, if applicable, to facilitate assembling list of patient home medications.		E-F
B8f. At each change in level of care, current medication orders available as input into transfer orders	Ability to designate from orders for prior level of care those to be continued as new orders for new level of care without necessitating rewriting of orders.		E-F
B8g. At each change in level of care, designation of which medication orders are being continued and which are being discontinued.			E-N
B8h. For each discontinued order at change in level of care, ability to select reason for not continuing			Des
B8i. Retention of history of medication reconciliation at each change in level of care (each pre- and post)	Capture and maintain lists of medications reviewed and ordered at each change in level of care.	Provides documentation that prior medications were reviewed and taken into account in writing of new orders	E-F
B8j. For discharge orders, ability to integrate and amend <i>outpatient medications recorded</i> at admission	(In addition to current inpatient orders)		Des
B8k. Ability to produce patient hand-out listing outpatient medications recorded at admission, inpatient medications, and discharge meds, as well as explanation of changes		For patient education at discharge	Des

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C. Critical CPOE Requirements for Achieving Value

Requirement	Description	Implications	Priority
C1. Drug contraindication screening	CPOE system links to the patient's current medication profile and automatically screens new orders for potential drug interactions.	These tools are necessary to perform basic checking of medication orders for interactions	
C1a. Drug-drug contraindication checking			E-N
C1b. Drug-drug contraindication checking including combination products			E-F
C1c. Drug-allergy contraindication			E-N
C2. Medication screening for therapeutic duplication			
C2a. Same component (drug)			E-N
C2b. Same drug class			E-N
C2c. Including components of combination products			E-N
C3. Single dose and cumulative medication dosage checking			
C3a. Single dose	Check of min-max range for patient based on age (pediatric, adult, geriatric)		E-N
C3b. Daily dose	System automatically factors into dosage checking the accumulated daily doses	This feature is necessary to include frequency in dosage checking.	E-N
C3c. Cumulative dose	For certain medications		Des
C3d. Dosage checking incorporating patient specifics	For medications with weight-based dosing and chemotherapy, which is usually dosed in M ²		E-F
C4. Medication contraindication screening incorporating patient-specific information	Screening incorporates relevant patient information to detect possible contraindications	Incorporating patient-specific information such as weight and age into the screening logic is necessary to avoid common adverse drug events for some medications.	
C4a. Warnings based on patient age			E-F
C4b. Warnings based on patient diagnosis			E-F
C4c. Warnings based on laboratory test results for patient	e.g., medication is contraindicated in patients with reduced kidney function		E-F
C5. Ability to manage rules for medication checking and other clinical decision support	Table-driven or other design, which simplifies establishing and maintaining the rules used to trigger decision support.	Writing individual rules (using a rules engine) is not practicable for the large number of situations involved.	

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Requirement	Description	Implications	Priority
C5a. Table-driven management of parameters for medication checking incorporating patient-specific information	Design for recording ranges in patient age, weight, BSA, renal status, etc. to be used in patient-specific medication checking that does not require uniquely writing the logic for each medication to which the rule is applied.		E-F
C5b. Hospital control of drug classes checked for therapeutic duplication	Hospital can turn on/off duplication checking for classes of medications	This feature is important for sufficiently fine-tuning medication-related advisories and alerts so as to achieve an acceptably low level of "nuisance" alerts. The norm today—controlling checking only at the highest level (all/none) leads to an intolerable number of nuisance alerts and turning off of checking altogether in some cases.	E-F
C5c. Hospital control of level of checking for drug-drug interaction	Hospital can set different levels of severity alerting for <i>individual medications</i> and classes of medications.	See above	E-N
C5d. Ability to provide informational messages about apparent interactions or other contraindications	Messages displayed can contain text concerning the nature of the interaction and additional information on clinical consequences/severity in addition to the basic warning message.	Providing more information about the warning will increase the usefulness and acceptance.	Des
C5e. Ability to manage laboratory duplicate checking	Table-driven design or other approach for identifying tests and time intervals to be used in checking that does not require writing unique rules (logic) for each set of conditions to be flagged.	One design approach is the ability to set conditions for checking in order master file (as opposed to requiring use of a rules engine to write each rule).	E-N
C5f. Ability to manage auto-display of relevant laboratory test results during medication ordering	Table-driven or other design for specifying pre-defined associations between medications and test results to be automatically displayed that does not require writing unique rules (logic) for each condition triggering auto-display.	One design approach is the ability to set lab result to display in medication order master file (as opposed to requiring use of a rules engine to write each rule).	E-N
C5g. Ability to control delivery of CDS by user class	Necessary to fine-tune decision support to achieve acceptable rate of relevant messaging (fellow versus medical student) and to manage responses to decision support		E-N
C5h. Ability to control delivery of CDS by user clinical department	e.g., Oncology versus Medicine		E-N
C5i. Ability to designate consequences of alerts	Ability to require user acknowledgment or limit user interactions for selected alerts based on hospital philosophy and policy. E.g., When conditions in the rule are met, physician not permitted to write this order (a "hard stop").	Clinical decision support can be informational/advisory or set up to require or preclude certain actions. Some hospitals wish to designate selected situations as prohibited because of the nature of the likely risk to patient safety.	E-N
C6. Delivery of prompts, alerts, and other decision support as the physician is considering what to order	The sooner decision support feedback is integrated into ordering tasks the better (e.g., not as the physician is signing orders for the patient)	Decision support is most useful to, and best accepted by, physicians when it is delivered during ordering.	
C6a. Patient allergy message triggered	Notification as order is written while selecting the medication or browsing		E-N

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Requirement	Description	Implications	Priority
C6b. Display of dose calculator or calculated dose for medication requiring weight-based dosing	Proactive guidance as physician is considering dose	Especially important for pediatrics	E-N
C6c. Display of dose calculator or calculated dose for medication requiring consideration of renal status ("renal dosing")	Proactive guidance as physician is considering dose		E-N
C6d. Starter set of rules for top medications requiring consideration of renal status in dosing ("renal dosing")	MTC/NEHI to supply rules for ~250-300 medications		E-N
C6e. Ability to use TALL MAN Lettering or other means to flag Look-Alike medications commonly confused	For certain pairs medications that have similar spelling and are often confused, leading to medication errors		E-F
C7. Ease of responding to clinical decision support.	Physicians can easily accept or reject prompts or alerts containing recommendations delivered via decision support.	This feature has not only an effect on time to accomplish ordering, but also acceptance of clinical decision support.	
C7a. Ability to accept recommended dose or other advice in prompt rather having to rewrite the order	When an alert is triggered, the user can take the actions suggested directly from the alert dialog box. Actions may include discontinuing, modifying, or canceling an existing order or the one in process or entering a new order.		E-N
C8. Corollary orders	<i>CPOE</i> can facilitate ordering of secondary orders that should accompany an order to put in place necessary preparation or monitoring.	Making it as easy as possible to place these orders during order entry improves compliance and saves physician time.	
C8a. Automatic display of linked secondary orders	Ability to have recommended secondary orders display with the primary order (e.g., lab test to titrate dosing)	Physician can easily add suggested secondary order with a simple click or selection.	E-N
C8b. Schedule-dependent corollary orders	For some procedures with timing of secondary orders based on schedule (e.g., stress test), completion of secondary orders once procedure is scheduled	Non-completion of an event (e.g., bowel prep) results in cancellation of order (e.g., colonoscopy).	E-F
C9. Automatic display of relevant laboratory test results or vital signs relevant to order	System can associate medications and relevant lab tests for automatic display with a medication order	This both reminds a physician to consider the relevant information and makes it easy to do so.	
C9a. Ability to auto-display relevant laboratory test result or trend in test results for patient when physician selects a medication order		A form of proactive decision support for medication orders for which patient status needs to be considered in determining appropriateness and dosing.	E-N
C9b. Starter set of medication orders for which displaying most recent relevant laboratory test is of high value	MTC/NEHI to supply list		E-N

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Requirement	Description	Implications	Priority
C10. Special features of order sets	Every CPOE solution contains sets of orders physician can select and edit as necessary for a particular patient before signing. Requirements listed below are design features of order sets.	Pre-defined orders are developed to incorporate recommended clinical practices. The design features listed enhance the ability of the hospital to guide ordering in a way that increases both the CDS value and physician acceptance.	
C10a. Ability to incorporate choices in an order set for a medication or other intervention	The intent is to propose alternatives in a given functional group, e.g., if order set includes a diuretic, physicians are presented with the most likely ones from which to choose one for the patient.		E-N
C10b. Ability to check that no more than one of multiple options presented for an order is selected	Either/or		E-F
C10c. Ability to incorporate text instructions or recommendations within order sets			E-N
C10d. Individual orders in order sets subjected to same order checking (all types) as individual orders	CDS applies to all orders, including those included as part of an order set	Necessary to extend safety net of clinical decision support to all orders written for patients	E-N
C10e. Vendor-facilitated access to starter set of order sets	Either a vendor-developed starter set or facilitated access to a library of customer order sets	For jump-starting development of hospital-specific order sets	E-N
C11. Cost advisories	System messages that encourage selection of cost-effective and appropriate medications and other interventions	These are proven tools for encouraging cost-effective care management and reminding physicians of applicable recommendations of hospital committees.	
C11a. Ability to display orderable item costs as part of order template		To convey knowledge about costs. Note many hospitals use charges because of lack of information about true costs.	E-F
C11b. Ability to display recommended drug substitution		To recommend more cost-effective treatment	E-N
C11c. Ability to display indications for medication, test, or procedure use	For a particular medication, imaging study, etc., the ability to convey information to physicians about recommended practices for appropriate utilization	To discourage inappropriate use	E-N
C11d. Ability to <i>indicate</i> medication on the formulary of the patient's payer			Des
C11e. Laboratory <i>test</i> duplicate checking	System flags laboratory tests as potentially unnecessary duplicates based on hospital-established time limits for prior tests.	This is a proven tool for reducing unnecessary testing.	E-N
C11f. Starter set of laboratory tests with high value of duplicate checking	MTC/NEHI to supply list		E-N

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Requirement	Description	Implications	Priority
C12. Use of defaults to encourage appropriate orders	Guide ordering by defaulting or highlighting order elements to the most likely correct content	Makes it easy to do the right thing	
C12a. Hospital formulary	Ability to have selected medication default to formulary options or have those listed first	Making the selection of formulary medications easy increases compliance with formulary management	E-N
C12b. Route of administration	For medications, ability to have route default to the most likely or only possible		E-N
C12c. Dose default	Based on min-max for patient age group (e.g., pediatrics, adults, geriatric)		E-N
C13. Ability to highlight most likely or recommended choices of orders and order components	Guide to likely appropriate choice		
C13a. Site-defined order of options in choice lists <i>for orders and order components</i>	Choice lists need not be organized alphabetically		Des
C13b. Ability to highlight options in choice lists <i>for orders and order components</i>	Site-defined highlighting of most likely appropriate or recommended choice		Des
C14. Logging of clinical decision support functions	An audit trail on the firing and use of clinical decision support for viewing and printing	Needed for ongoing management of quality/safety and decision support tools. Also likely to be needed for performance reporting <i>for MTC/NEHI/CPOE project.</i>	
C14a. Use of order sets			E-N
C14b. Firing of alerts			E-N
C14c. Order changes following firing of alerts			E-N
C14d. Ability to require coded reason for overrides of selected alerts			E-N
C14e. Ability to display/print log for overrides including user-entered comments			E-N
C15. ISMP Guidelines for Safe Electronic Communication of Medication Orders	Relate to safe presentation of drug nomenclature and dose expressions in electronic systems and design features that support safe communication of orders [some already elsewhere in standards and some related to set up of order master files] www.ismp.org/MSAarticles/improvePrint.htm	Many of these requirements are applicable to set up of data field specifications, allowable and pull-down entries, etc., that are followed by the hospital team implementing a vendor's application. For vendors, the requirement is to permit following these practices (i.e., not preclude doing so by a design feature in the CPOE application).	
C15a. Ability to list all products by generic name			E-N
C15b. Ability to list salt after drug name	e.g., warfarin Na		E-N
C15c. Ability to present brand names in upper case letters			E-F

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Requirement	Description	Implications	Priority
C15d. Do not use trailing zeroes			E-N
C15e. Use leading zeroes for doses less than one measurement unit			E-N
C15f. Spell out UNITS			E-N
C15g. Ability to use commas in doses expressed in thousands			E-F
C15h. Ability to use "thousands" and "millions" as part of expressing dose for large doses			E-F
C15i. Ability to use USP standard abbreviations for dosage units			E-N
C15j. Provide adequate space for items in order data fields	> three characters so that dangerous abbreviations need not be used	For rare instances in which free-text might be used	E-F
C15k. For selected orders, ability to include a field for user to select purpose	All PRN meds, problematic look-alike name pairs, meds with different dosing for different indications or multiple indications not in approved labeling		E-N
C15l. Provide a field that requires entry of product's dosage form	e.g., tablets, capsules		E-N
C15.m Ability to require dose field after product strength has been selected			E-N