Considerations for using Order Sets as Basic Building Blocks for Computerized Provider Order Entry

Section of Informatics and Technology Webinar
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Overview

- Benefits of electronic order sets within an EHR
- Design and maintenance of order sets
- Governance/Resources
- Novel ways to improve care with order sets
- Key Lessons

Benefits of Standardized Order Sets

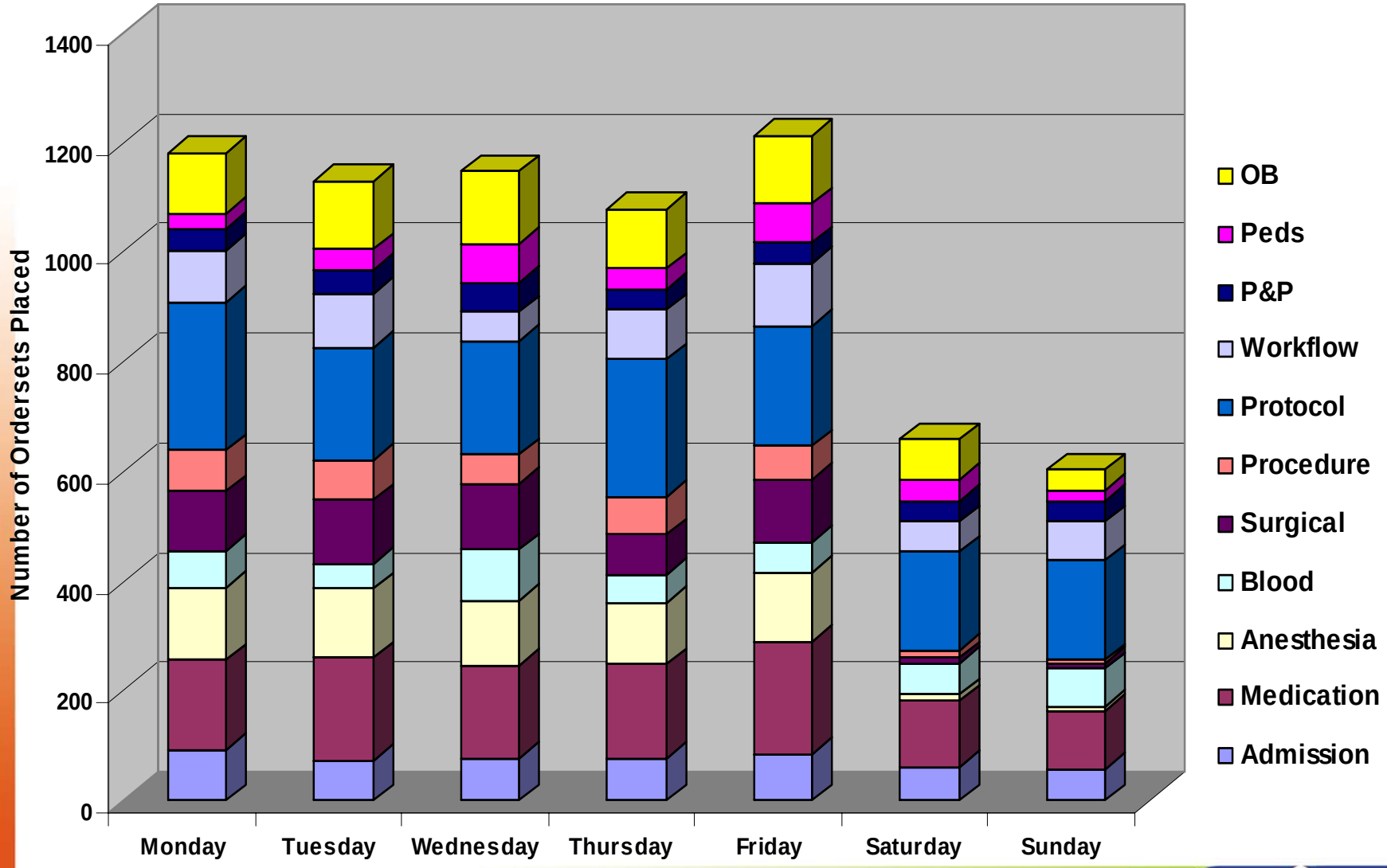
Make the Right Thing Easy to Do

- Legible, structured and complete physician orders
- Reduction in reliance on memory
- Increase provider efficiency
- Reduce practice variation
- Reduction in the number of medication errors and ADEs
- Broad access to clinical literature at point of care
- Integration of clinical evidence to current care processes

Electronic Order Sets vs. Paper Order Sets

Paper Order Sets	Electronic Order Sets
Difficult to find	Readily accessible from anywhere
Clinician unaware of order set	Real time prompts
Updates lag behind practice change	Updated more easily (and quickly)
Difficult to remove 'old version' from patient care areas	Old version is replaced with new version
Patient may need multiple order sets	Ability to link order sets for standardized elements of care
Possibly evidence-based	Can be directly linked to evidence-based literature

Order Set Usage at NMH



Design and Maintenance

The Ten Commandments

1. Speed is everything
2. Anticipate needs and deliver in real time
3. Fit into the user's workflow
4. Little things can make a big difference
5. Recognize that physicians will strongly resist stopping
6. Changing directions is easier than stopping
7. Simple interventions work best
8. Ask for additional information only when you really need it
9. Monitor impact, get feedback, and respond
10. Manage and maintain your knowledge-based systems

Adapted from Bates DW et al. *JAMIA.* 2003;10:523-30.

Design Considerations

- Order set template
- Design standards
- Patient safety considerations
- Compliance with quality initiatives
  - Core Measures
  - NSQIP
- Formulary issues
- Clinical author meetings

Clinical Care Guidelines

Capitalize on Opportunity to Standardize

- Peri-operative antimicrobial prophylaxis
- DVT/VTE prophylaxis
- Post operative nausea and vomiting
- Glucose management
- Sedation for mechanically ventilated patients
- Bowel medication incorporated in order sets with opioids
- Standardized choice and dose of sleeping aids
- Standardized dosing guidelines with ketorolac

Order Set Review Guiding Principles

- Interdisciplinary Review (including clinical author) for:
  - Variance from medical evidence
  - Compliance with the formulary
  - Consistency of care across order sets
  - Potential for adverse event or patient harm
  - Potential for introducing new error
  - Prioritize alerts within the order sets
- Oversight by Clinical Informatics Committee

Finding the Order Set …

Search: post | Starts with | Type: Inpatient

Up | Home | Favorites | Folders | Folder: | At location: NMH

- Post Angiography IR Order Set
- Post Cardiac Catheterization Order Set
- Post Chemoembolization Order Set
- Post Electrophysiology Study Order Set
- Post Gastrectomy (for Dumping Syndrome)
- Post Invasive Procedure Nursing Recovery Proto...
- Post Macro-Aggregated Albumin Order Set
- Post Neuraxial Morphine Order Set- Anesthesia OB
- Post Non-Invasive ICD Check Order Set
- Post Op Anterior/Posterior Cervical Fusion Order ...
- Post Op Aortic Surgery Order Set
- Post Op Bowel Resection Order Set
- Post Op Cardiac Surgery Order Set
- Post Op Carotid Artery Stent Order Set
- Post Op Endovascular Aortic Repair Order Set
- Post Op Esophagectomy Order Set
- Post Op Female Urology Order Set
- Post Op Gastrectomy Order Set
- Post Op Heart Transplant Order Set - Cardiac Sur...
- Post Op Isolated Intestinal Recipient Transplant O
- Post Op Lumpectomy/Mastecto
- Post Op Open Esophageal Surg
- Post Op Oral Maxillofacial Surge
- Post Op Pancreatic Surgery (ICU
- Post Op Pancreatic Surgery Ord
- Post Op Pubovaginal Sling Orde

- Anesthesiology
- Anesthesia Obstetrics
- Anesthesia Pain Service
- Cardiac Cath Lab
- Cardiac Surgery
- Cardiology
- Cardiothoracic Surgery
- Endocrine Surgery
- General Medicine
- General Surgery
- Gyne Surgery- PWH
- Hem/Onc
- ICU/Critical Care
- Interventional Radiology
- Neurology
- Neuroradiology
- Neurosurgery
- Obstetrics
- Ophthalmology
- Oral Maxillofacial Surgery
- Ortho
- Pain Management
- Pediatrics
- Plastic Surgery
- SIP
- Thoracic Surgery
- Transplant
- Trauma Surgery
- Urology
- Vascular Surgery

Neurology

Standardized Care Embedded in Order Sets

Careset - Aortic Surgery Post Op Order Set

Component	Order Details
XRAY Portable Chest AP (Portable XRAY Chest AP)	InAM, Once, Order for Future Activation
CARDIOLOGY TESTING	
ECG/Electrocardiogram	InAM, Once, Order for Future Activation
RESPIRATORY SERVICES	
Ventilatory Support only available, as clinically indicated, for patients in special care areas.	
Ventilatory Support - Mech Ventilation	Order for Future Activation
Sedation/Analgesia ICU MD Protocol Order Set	
O2 Therapy - Nasal Cannula	2 lpm, Order for Future Activation
CONSULTS	
PT Evaluation and Treatment (Physical Therapy Consult)	Order for Future Activation
OT Evaluation/Treatment (Occupational Therapy Consult)	Order for Future Activation
Smoking Cessation Consult	Order for Future Activation

Standardized Care Protocol

Careset - Sedation/Analgesia ICU MD Protocol Order Set

Component	Order Details
TO INITIATE PROTOCOL:	
Sedation/Analgesia & Assessments per ICU Protocol	
FOR MECHANICALLY VENTILATED PATIENTS:	
Oral Care	TID
Elevate Head of Bed (Elevate HOB)	Degree Elev: greater than/equal to 30
Glucose Fingerstick	QID, Call house office if greater than 100 mg/dL
ANALGESIA FOR PAIN (MD to select one; RN to order subsequent dosing per protocol)	
STEP 1: INITIAL BOLUS DOSING	
fentanyl	25 mcg, IV Push, Q 5 Minutes, PRN Pain, For: 3 HR
STEP 2: IF GOAL IS MET USING BOLUS DOSING	
fentanyl	25 mcg, IV Push, Q 30 Minutes, PRN Pain
STEP 3: IF GOAL IS NOT MET USING BOLUS DOSING, SELECT THE FOLLOWING FENTANYL INFUSION:	

Embedded Reference Available at POC

Decision Support

IDENTIFIED ORDER:
1 - Electrolyte Replacement ICU Protocol (Electrolyte Replacement per SICU/NICU Protocol)

Reference

1 - Electrolyte Replacement ICU Protocol (Electrolyte Replacement per SICU/NICU Protocol)

CarePlan information | Chart guide | Nurse preparation | Patient education | Policy and procedures | Sch

ICU Electrolyte Replacement

Must be infused slowly per guidelines.

Potassium Replacement: Recheck Potassium after infusion complete.
(Normal Potassium laboratory values: 3.5-5.0 mEq/L)

Serum Potassium Level	Potassium Chloride Replacement
Greater than 5 mEq/L	Notify Physician
3.9-4.9 mEq/L	No Intervention
3.6-3.8 mEq/L	20 mEq/L Potassium Chloride IVPB
3-3.5 mEq/L	40 mEq/L Potassium Chloride IVPB
2.5-2.9 mEq/L	60 mEq Potassium Chloride IVPB
Less than 2.5 mEq/L	60 mEq Potassium Chloride IVPB

Magnesium Replacement: Recheck Magnesium after infusion complete.
(Normal Magnesium laboratory values: 1.8-2.5 mg/dL)

Serum Magnesium Level	Magnesium Sulfate Replacement
1.9-2.4 mg/dL	No Intervention
1.6-1.8 mg/dL	2 g Magnesium Sulfate IVPB
1.2-1.5 mg/dL	4 g Magnesium Sulfate IVPB
Less than 1.2 mg/dL	4 g Magnesium Sulfate IVPB

Print

Direct Access to Policies and Protocols

Careset - Obstetrics - Active Management of Labor Protocol

Component	Order Details
If placing this order on a patient not currently admitted, place the following orders as future orders.	
PROTOCOL	
☑ Active Management of Labor Protocol	
CONTINUOUS INFUSI	
☑ Sodium Chloride 0.9% (titrate) 250 mL + oxytocin* 15 Unit	IV Infusion, Titrate Parameters: Titrate per Active Management of Labor Protocol.,

Reference Manual...

Decision Support

IDENTIFIED ORDER:
Active Management of Labor Protocol

Reference

Active Management of Labor Protocol — Search

○ CarePlan information ○ Chart guide ○ Nurse preparation ○ Patient education ◉ Policy and procedures ○ Scheduling information

Prentice Policy 1.03
Effective 12/04
Active Management of Labor

Desired Functionality

- Linked orders
  - Sequential orders
- Nested order sets
- Mutually exclusive orders
- Plan now; execute later
- Ability to address duplicates when placing order set
- ‘Smart’ order sets
  - Consider dynamic patient parameters

Governance / Resources

Northwestern Memorial Hospital Provides the Best Patient Experience from the Patient's Perspective

Objectives:

- Deliver Effective Care
- Deliver Care That is Safe and Without Error
- Coordinate Care to Meet Each Patient's Unique Needs
- Deliver Care That is Timely and Convenient

Deliverables:

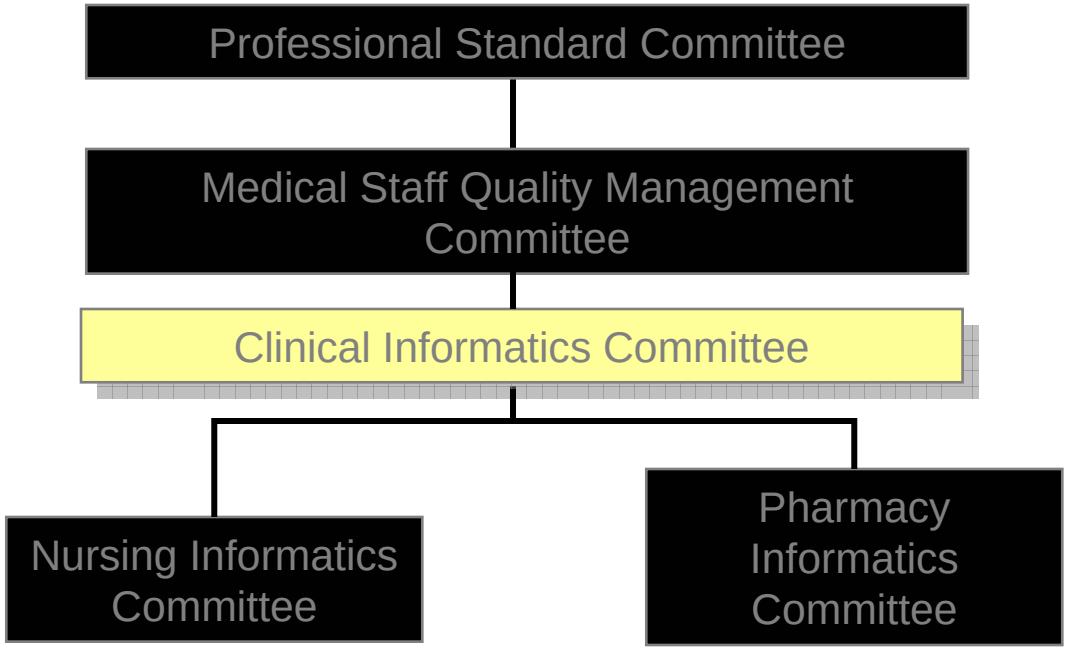
- Defined evidence-based quality indicators that are monitored and improved through the NM Quality Process
- A process to integrate new evidence-based practice for all patients

Initiatives/Tactics:

- Clinical Documentation
- CPOE – Computerized Provider Order Entry
- Electronic Medication Administration Record (eMAR)
- Standard Order Sets
- Rules and Alerts
- Outcomes Analysis and Reporting

Clinical Informatics Committee

Provides Oversight for the EHR within Hospital Quality Structure



- Oversight of electronic clinical documentation, evidence based order sets, and the prioritization of automated rules and alerts for clinical decision support
- Review recommendations for the electronic medical record to facilitate documentation and electronic communication and assure adherence to national standards
- Select and report system-wide quality measures to assess the benefits of the electronic medical record, monitor selected evidence-based practices, and assess the impact of decision support tools on clinical practice.

Resources …Never Enough

- Initial transition to electronic – 2-3 years
- Dramatic increase in requests at go-live
- Committee involvement
  - Pharmacy and Therapeutics
  - Quality Committees
  - New Committee
- Approval process – Departmental review
- Change management

Using Order Sets to Problem Solve

Safe Warfarin Prescribing

warfarin (Coumadin)	6 mg, PO, Daily (HS)
warfarin (Coumadin)	7.5 mg, PO, Daily (HS)
warfarin (Coumadin)	10 mg, PO, Daily (HS)
warfarin (Coumadin)	
Orders for CUSTOMIZED Warfarin (Coumadin) doses at Bedtime MAY NE CHOOSE MORE THAN ONE ORDER	
Please verify first dose start date & time FOR EACH ORDER	
For Monday, Weds, Friday dose at Bedtime:	
warfarin (Coumadin)	
For Tuesday, Thursday, Saturday, Sunday dose at Bedtime:	
warfarin (Coumadin)	
For Monday, Weds, Friday, Sat, Sunday dose at Bedtime:	
warfarin (Coumadin)	
For Tuesday, Thursday dose at Bedtime:	
warfarin (Coumadin)	
Every other day dose, FIRST DOSE TONIGHT:	
warfarin (Coumadin)	
Every other day dose, FIRST DOSE TOMORROW NIGHT:	
warfarin (Coumadin)	
Orders for a different dose each day of the week:	
warfarin (Coumadin)	
warfarin (Coumadin)	
warfarin (Coumadin)	

Discern

ORDER ALERT

To ensure safe order entry, please use the coumadin/warfarin order set.

Alert Action

☑ CANCEL

Add Order for:

☑ Warfarin (Coumadin) Order Set

OK

Design to Push Information

Careset - Electrolyte Replacement Order Set - Intravenous

Component	Order Details
Electrolyte Replacement Orders, Intravenous	
☑ Order Set - Electrolyte Replacement, IV	
Potassium Chloride - PERIPHERAL LINE	
Select ONE of the following as appropriate:	
☐ potassium chloride (Potassium Chloride in Solution)	20 mEq, IVPB Peripheral, Once
☐ potassium chloride (Potassium Chloride in Solution)	40 mEq, IVPB Peripheral, Once
☐ potassium chloride (Potassium Chloride in Solution)	60 mEq, IVPB Peripheral, Once
☐ potassium chloride (Potassium Chloride in Solution)	mEq, IVPB Peripheral, Once
Potassium Chloride - CENTRAL LINE	
Infuse via CENTRAL LINE ONLY	
Select ONE of the following as appropriate:	
☐ potassium chloride (Potassium Chloride in Solution)	20 mEq, IVPB Central, Once
☐ potassium chloride (Potassium Chloride in Solution)	40 mEq, IVPB Central, Once
☐ potassium chloride (Potassium Chloride in Solution)	60 mEq, IVPB Central, Once
☐ potassium chloride (Potassium Chloride in Solution)	mEq, IVPB Central, Once
Magnesium Sulfate	
Select ONE of the following as appropriate:	
☐ magnesium sulfate (Magnesium Sulfate in Solution)	2 g, IVPB, Once
☐ magnesium sulfate (Magnesium Sulfate in Solution)	4 g, IVPB, Once
☐ magnesium sulfate (Magnesium Sulfate in Solution)	6 g, IVPB, Once

	4/24/2005 20:55	4/22/2005 14:30	4/20/04
Creatinine	2.0	1.9	1.6
Calcium	9.2	9.3	9.6
Magnesium	2.2		2.1
Phosphorus			
Potassium	4.2	3.9	3.6

Details | Order Comments

Order details

Detail

Built-in Prompts

RADIOLOGY

- [ ] XR Chest PA /Lateral (2 View)
- [ ] XR Chest AP (Portable)

RESPIRATORY SERVICES

- [ ] O2 Therapy - Nasal Cannula (Oxygen Therapy - Nasal Cannula)
- [ ] O2 Therapy - Simple Mask (Oxygen Therapy - Simple Mask)
- [ ] O2 Therapy - High Humidity Trach Collar (Oxygen Therapy - High Humidity Trach Collar)
- [ ] Patient Driven Respiratory Care Program

**Complete the Bronchial Hygeine Form if selecting the above Evaluation Request order.

CONSULTS

- [ ] PT Evaluation and Treatment (Physical Therapy Consult)
- [ ] OT Evaluation/Treatment (Occupational Therapy Consult)
- [ ] Clinical Nutrition Consult
- [ ] Smoking Cessation Consult
- [ ] Social Work Consult
- [ ] Discharge Planning/Utilization Review Consult

MISCELLANEOUS ORDERS (non-modifiable)

- [x] Physician/APN Information
- [x] Medication Reconciliation
- [x] Order Set - Admission to Medicine

PROBLEMS

- [x] Problems

Incorporates requirements into clinician workflow

Built-in Prompts

Physicians/ APN Form

Inpatient Service

- Medicine, Attending Only
- Medicine, A Firm
- Medicine, B Firm
- Medicine, Hospitalist
- Bone Marrow Transplant (Purple)
- Breast Surgery (Bethke/Staradub)
- Cardiothoracic Surgery
- CCU
- Colorectal Surgery (Halverson/Stryker)
- Endocrine Surgery (Angelos)
- General Cardiology
- General Surgery (Hartz)
- General Surgery (Ujiki/Toyoma)
- Gynecologic Oncology
- Heme/Onc, Housestaff Uncovered (Green)
- Hepatology
- Maternal/Fetal Medicine
- MICU
- Neonatal Intensive Care
- Neurology, General
- Neurology, Stroke
- Neurosurgery
- Obstetrics
- Orthopedics, Foot/Ankle
- Orthopedics, General
- Orthopedics, Spine
- Orthopedics, Sports Medicine
- Orthopedics, Total Joints
- Psychiatry, General-8E Stone
- Psychiatry, General-8W Stone
- Psychiatry, Private
- Solid Tumor Oncology (Blue)
- Surgery, GI Team (Bell, et al)
- Surgical Oncology (Talamonti/Wayne)
- Transplant Surgery
- Trauma
- Urology, Blue (Private)
- Urology, Green
- Urology, Red
- Vascular Surgery
- Other:

7 Days | Vitals/Meds | Labs | Rad/Studies | All Doc | Forms | Notes | Orders | Med Profile | MAR | I/O | Problems/Pt Info | **MD/APN/Contacts**

Flowsheet: Physicians APN Tab ... Level: Physicians APN Tab More Table Group List

18 September 2007 20:33 - 20 September 2007 18:29 (Admit to Current Date)

Physicians APN Tab	9/19/2007 21:40	9/19/2007 18:18	9/18/2007 20:57
Physicians APN Tab			
	Medicine, B Firm	Medicine, B Firm	MICU
Attending Physician	MUNSAYAC, JOSEPH R.	MUNSAYAC, JOSEPH R.	MOORE, MICHAEL J.
Inpatient Resident	HARINSTEIN, MATTHEW	HARINSTEIN, MATTHEW	SHI, YAN
Inpatient Resident (First Year Intern)	LOTSU, DZIFAA	LOTSU, DZIFAA	PETRUNGARO, KATHRYN
Fellow			PRICKETT, MICHELLE
Primary Continuity Physician	COSTAS, ANGELO	COSTAS, ANGELO	COSTAS, ANGELO

Built-in Prompts

Careset - Problems

Component	Order Details
PROBLEMS (will be added to the Problem List)	
Please select problems below related to Smoking Cessation.	
☐ Current Smoker	
☐ Former Smoker but Quit Within Last 12 Months	
**Select orderset below for Smoking Cessation treatment options.	
☐ Nicotine Replacement Order Set	
**Please select other problems as appropriate.	
☐ Acute Pneumonia	
☐ Asthma	
☐ Chronic Obstructive Pulmonary Disease	
☐ Congestive Heart Failure	
☐ Coronary Artery Disease	
☐ Atrial Fibrillation	
☐ Hypertension	
☐ Diabetes Mellitus	
☐ Osteoporosis	
☐ Dialysis	
OTHER PROBLEMS	
To select a problem other than or in addition to those listed above, click below in front of "Problems & Clinical Diagnoses".	
☐ Problems & Clinical Diagnoses	

Supports easy entry of diagnoses / problems

Built-in Prompts

Patient Safety Alert: Medication Management Essentials

Please update and review ALL home medications for this patient NOW.

To add home medications, right click on a green bar in the Medication Profile and choose 'Add Medication by Hx'.

If patient is on no home medications, add the 'No Home Medications' order to the Medication Profile.

To view an example, click here.

Medication Profile

Change View

Name	C..	I...	Provider	Start	Last Updated	Status
Medication(s) Being Given						
Current						
Past						
Prescription(s)/Home Medi...						
Current						
Past						

Medication Reconciliation

Home Medication Note

- Home medications documented above are correct and complete
- Medications listed above are likely incomplete and require further investigation. Will use the Medication Reconciliation order to update when more information is available
- Unable to obtain information regarding home medications at this time

Information Source (check all that apply):

- Patient
- Family; Caregiver
- Past Medical Records
- Patient's Medication List
- Prescription Bottles
- Other:

Urgent Med Rec for Pharmacists

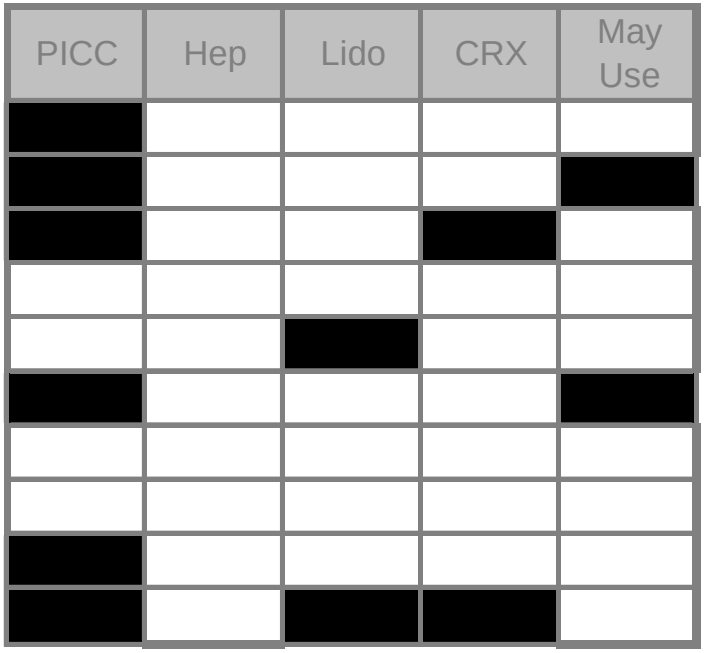
- Urgent Med Rec for Pharmacists

Improving Care with Order Sets
Catheter (PICC) Project

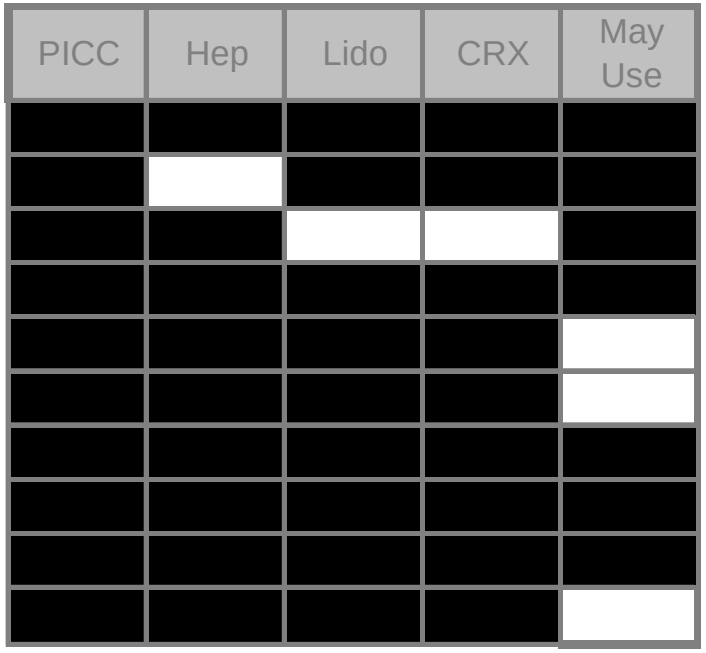
Expected Impact: 2200 Patients per Year

Previous Process vs. New IT-Based Process*

% usage of PowerChart:
24%



% usage of PowerChart:
88%



Indicates existence of PowerChart order

Key Lessons

Initial Challenges

- Resources
  - Sharing order sets between institutions
  - Need for national standards
- Translation from paper to electronic
- Clinician support / agreement
- Committee structure
- Standardized order sets vs. personal plans

Ongoing Challenges

- Resources
- Periodic review of clinical content
- Pushing the right order set to the user at the right time
- Vendor product functionality
- Handling orders during admission, transfer, OR
- Complicated medications (Chemotherapy)

Key Lessons

- Order sets are important building blocks for CPOE
- Making the right thing easier to do may increase user acceptance
- Order sets may provide the path to embed clinical prompts
- Align order sets with quality initiatives or metrics within your institution
- Pharmacists should be involved early and often
- At minimum, a pharmacist must review all order sets

Technology may not be the "silver bullet" some hoped it would be, but when accepted by clinicians, it can serve as a powerful lever to improve safety and quality.

Questions???