

Implementing Decision Support within CPOE and EMR Systems: Vanderbilt Experience

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Conflict of Interest Disclaimer

Vanderbilt University has entered into a licensing agreement with McKesson-HBOC for WizOrder and potentially other informatics-related products developed at Vanderbilt.

Vanderbilt University, The Informatics Center, Dr. Miller's Department, and various individuals benefit financially from this licensing arrangement. Related to the licensing agreement, Dr. Miller (among others) receives royalties from Vanderbilt University.

As an author/developer of INTERNIST-I and QMR at the University of Pittsburgh, Randolph A. Miller, M.D., in the past received royalty income from sales of the commercial version of QMR. These were donated to charitable institutions.

Early Case Report: The Imperfectability of Man

Shakespeare, W. *The Merchant of Venice*. 1597; Act I, Scene ii

**If to do were as easy as to know
what were good to do,
chapels had been churches, and
poor men's cottages princes' palaces.**

**... I can easier teach twenty what
were good to be done than
to be one of the twenty
to follow my own teaching.**

1 Patient-Specific Information

Core “Portable” Patient Summary:

Problems, Allergies, Meds

Local Electronic Patient Record

Orders: Active/Inactive

2 Local Knowledge

“Best of Care” Pathways

Institutional policies & costs

Drug interactions & formulary

Physician preferences

IDEA

**Patient Care Provider
at Decision Point**



ACTION

**Decision
Support
Integrated
into
Workflow**

3 Global Knowledge

Medical literature

Diagnostic databases regarding diseases

National guidelines

Patient databanks with outcome data

4 Algorithms to enhance care

Reminders, Alerts

Quality checks

Self-Generated Monitors

Decision support programs

WizOrder purpose and demographics

WizOrder was developed at Vanderbilt by DBMI faculty and Informatics Center staff to help ensure the highest quality of care for our patients, reducing medical errors.

It provides “point-of-care” relevant information resources to enhance and support clinicians’ decision-making at the time of order entry.

It has been refined by ongoing clinical feedback from House staff, nurses, attending MDs, committees, others at VUMC for the past 10 years.

WizOrder is now used on all beds at VUH by: Medicine, Surgery, Pediatrics, ED, and OB/GYN services.

Over 15,000 orders/day, 75% by MDs, rest by clinical staff

WizOrder Main Screen Layout: Simple, fixed format: functionally oriented, designed with users

The screenshot displays the WizOrder main screen layout, which is functionally oriented and designed with users in mind. The interface is divided into several sections:

- 1) Active orders:** A yellow box highlights the left sidebar, which contains various patient information and active orders. This includes sections for Pharmacy alerts, Admission, Diagnosis, Condition, Vital signs, Activity/limitations, Allergies, and Nursing instructions.
- 2) Common useful orders based on patient location:** A yellow box highlights the right sidebar, which lists common orders for MICU. The list includes: 1. emergency drugs / code in MICU, 2. STAT labs / tests, 3. next morning STAT labs / tests, 4. QAM STAT labs / tests, 5. MICU orders, 6. medications, 7. workups, 8. initiate level of care, 9. initiate collaborative path, 10. transfer to, 11. titrate FiO2, 12. PT evaluation and treatment, 13. OT evaluation and treatment, and 14. Return to previous list.
- 3) What to do next in WizOrder:** A yellow box highlights the central area, which prompts the user to "Select an item from the list" or "enter another order".
- 4) Buttons for commonly used features:** A yellow box highlights the bottom of the screen, which contains a row of buttons: Print, Change display F2, D/C, C/S, Order sets F4, ops F5, Help F6, Another patient F7, and Print orders F8.

The main content area shows a list of orders for a patient named B __, A __ /ALLEN. The first order is "gen 80 iv q12h", which is highlighted in yellow. A text box above this order states: "Physician enters order for antibiotic, Gentamicin, by partially typing its name".

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Generic name: gentamicin. Trade name: GENTAMICIN SULFATE

Recommended doses are:

- less than 7 days: 0 to 5 mg/kg/24h
- between 7 days and 12 years: 6 to 7.5 mg/kg/24h
- more than 12 years: 1 to 2 mg/kg/dose

all iv gentamicin doses should infused over 30 minutes regardless of dose
indications: treatment of serious aerobic bacterial infections due to susceptible organism, including pseudomonas, klebsiella, proteus, e. Coli & staph.
Dose: im or iv over 30 min: dose based on body wt & renal function (calculated crcl). Adult dose: based on recent meta-analysis (ann intern med 1996;124:717-725) in pts w/crcl >60ml/min, dose is 1.3-1.6mg/kg q8hrs; or 2-3mg/kg q12hrs; or 4-6mg/kg q24hrs (hartford hospital suggests up to 7mg/kg/day w/normal crcl) max dose used in pts >70yrs was 4mg/kg/day; w/elderly maintain trough <1.4mg/l
children: 6-7.5mg/kg/day or 240mg/m² in 3-4 divided doses; infants & neonates 7.5 mg/kg/day in 8hr intervals; premature neonates, 2.5mg/kg/dose q12hrs.
Reduce dosage or prolong interval w/renal impairment. Side eff: nephrotoxicity (reversible tubular damage) & ototoxicity (high pitched hearing loss/vertigo).
Notes: individualized dosing may be needed based empirically on renal function measured peak/trough. Usual peak/trough w/qd dosing 10-14mcg/ml & <2mcg/ml.

- ◆ gentamicin
 - ℒ succinylcholine ▶ Aminoglycosides may potentiate neuromuscular blockade
 - ℒ metocurine ▶ Aminoglycosides may potentiate neuromuscular blockade
 - ℒ atracurium besylate ▶ Aminoglycosides may potentiate neuromuscular blockade
 - ℒ ethacrynic acid ▶ Ehtacrynic acid may enhance ototoxicity of aminoglycosides

- ◆ *gentamicin sulfate
 - ℒ *viaflex 250ml iv fluids ▶ All gentamicin doses go in 100ml bags

- ◆ aminoglycoside class
 - ℒ *temafloxacin protocol m91-626 ▶ Additional antimicrobials prohibited-temafloxacin protocol

- ◆ *aminoglycosides-parenteral

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Currently ordered medication

Monographs prepared by VUMC pharmacy available for medications as MDs order them

Print

Print two copies

Done

Page up

Page down

Print orders F8

B __, A __ /ALLEN

GENTAMICIN INJ: GARAMYCIN

Estimated CrCl=21 ml/min based on Creat=1.8 on Apr 25 06:00

Information: recommended dose for single daily iv dosing: 4-7 mg/kg/24h

ADC VAAN DISML display

Pharmacy alerts ♦ (click on alerts for more information)
Zosyn no longer available-click here for information
Amiodarone may enhance pharmacologic effects of hydantoin

- a) Dose: 80 MG
- b) Route: IV
- c) How often: Q12H
- d) When to start (first dose): NEXT SCH
- e) For how long: UNTIL D/C

Currently ordered medication

Admission

admit to micu ▶ Apr 15 01:00...
admit to service: rec
attending: snapper x
initiate collaborativ
initiate level of care

Diagnosis

diagnosis: heart fail
patient specific data

Condition

condition: guarded

Vital signs

measure weight qam
vital signs q2h ▶ Apr

Activity/limitations

activity-bedrest ▶ A

Allergies

no known allergies ▶ Apr 15 01:00...

Nursing instructions

catheter drng-measure & record per unit save
- to gravity drainage ▶ Apr 15 01:00...
start bath 20 days - Apr 22 00:00

Warning

Dose: 80 mg q12h
Dosing weight: 53.5 kg
Creatinine clearance: 21.76 ml/min
Estimated steady-state levels:
peak: 10.9 ug/ml
trough: 5.6 ug/ml

Trough level too high!

Suggested dose: 80 mg q24h
peak: 7.4 ug/ml
trough: 1.8 ug/ml

Click <OK> or press <ENTER> to continue.

OK

WizOrder uses pharmacokinetic model to estimate drug distribution in this patient, based on parameters such as weight and renal function, and displays warning and suggested proper dose if MD's dose out of range (too high or too low).

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Print

Change display F2

D/C

C/S

Order sets F4



©ops F5

Help F6

Another patient F7

Print orders F8

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Print

Change display F2

D/C

C/S

Order sets F4



©ops F5

Help F6

Another patient F7

Print orders F8

WizOrder: Pharmacy warning about potential drug interaction

8021X ZTESTPAC, Reagon 1498664-0 33y/o M (TRAINIO)

ADC VAAN DISML display

Admission

- o "protocol: gvhd (csa and mtx)"
- o day 0 for bmt: 3/5/99 6:00
- o weight: 54.885kg/121lb; height: 152cm/60.0in; ibw: 50.0kg/110.2lb; bsa: 1.51m2;

Pharmacy warning for CYCLOSPORINE INJ. SANDIMMUNE:

1. Aminoglycosides may potentiate cyclosporine nephrotoxicity
2. Avoid aminoglycosides + cyclosporine in renal transplant pts

2) Clicking on drug interaction warning displays monograph from VUMC pharmacists about nature and severity of interaction

WizOrder Popup

Aminoglycosides may potentiate cyclosporine nephrotoxicity

Aminoglycoside antibiotics, when used in combination with cyclosporine a have been shown to have additive nephrotoxicity when used in combination. The severity of this reaction probably depends on the duration of combined use and the diagnosis of the patient. Bone marrow transplant patients on dr wolff's or dr greer's service should generally *Not* receive the two drugs in combination since therapy with an aminoglycoside in these patients can be expected to be prolonged due to profound neutropenia. In cardiac & renal transplant patients the potential for toxicity may be offset by the benefit of aminoglycoside therapy.

If this warning occurs in a patient on the bone marrow transplant service or in a patient of dr's greer, wolff, or stein then notify the physician about the potential for increased nephrotoxicity. Don't call in the middle of the night, however-leave a note for the day pharmacist to follow up

Back Home Print Close

Pharmacy warning

[a](#) order it anyway
[b](#) don't order it

or select an item to display more information

3) WizOrder NEVER stops MDs from doing what they want to (they know patients better than computer does), so option to override warning always offered; log is kept of MD being warned

print <F1> display <F2> D/C <F3> renew cosign order sets <F4> oops <F5> help <F6> comments <F7> done <F8>

Start Microsoft Pow... Wizorder Dae... wizscr07.bmp - ... Wiz Order 1:54 PM

Sample PHM Warnings from WizOrder

[phm .dapw 1/4 NS::889:1/4ns (no additives) can cause hemolysis-click here for info

[phm .dapw ABCIXIMAB CONTINUOUS INFUSION::1280:For reopro dosing info click on this message

**[phm .dapw ACETAMINOPHEN W/CODEINE #2::-14:Multiple orders for acetaminophen.
Risk
of overdose.**

[phm .dapw ACETAMINOPHEN-ETOH FREE LIQ::715:Acetaminophen in sorbitol may cause diarrhea/cramping

[phm .dapw ACETAZOLAMIDE: DIAMOX::-3:Probable ALLERGY to this medication

[phm .dapw ACYCLOVIR 5% OINTMENT::222:No benefit w/acyclovir-ganciclovir comb

[phm .dapw ACYCLOVIR INJ: ZOVIRAX:229:Duplication of therapy: acyclovir & valacyclovir

[phm .dapw ALLOPURINOL: ZYLOPRIM:1416:Allopurinol may increase warfarin anticoagulant effect

**[phm .dapw AMIODARONE INFUSION::633:Amiodarone may double serum digoxin
concentration/effects**

[phm .dapw AMOXICILLIN-CLAVULANATE::-3:Probable ALLERGY to this medication

[phm .dapw AMOXICILLIN-CLAVULANATE::154:If pt can take oral amoxicillin, why not oral h2 blocker?

[phm .dapw AMPHOTERICIN B INJ: FUNGIZONE:125:Fluconazole reduces efficacy of iv ampho for aspergillus

**[phm .dapw AMPHOTERICIN B LIPID COMPLEX::1484:Fk-506 may inc. ampho b
nephrotoxicity**

[phm .dapw AMPRENAVIR: AGENERASE:1107:Drug may need to be special ordered - click here for info

[phm .dapw ATENOLOL: TENORMIN:1068:Beta blocker may enhance effects of hypoglycemics

**[phm .dapw ATORVASTATIN: LIPITOR:1184:Myopathy risk increased w/niacin &
statin/hmg coa red drugs**

**[phm .dapw CELECOXIB: CELEBREX:729:Celecoxib is for arthritis - click here if pt has
depression**

**[phm .dapw CITALOPRAM: CELEXA:820:Citalopram is for depression-click here if pt has
arthritis**

Adult Deep Venous Thrombosis Prophylaxis Advisor

Your patient is not receiving a treatment known to deter deep venous thrombus formation (or you specifically requested this advisor).

Recent literature [\(click HERE for information\)](#) indicates the risk of DVT is significant in hospitalized patients due to multiple DVT risk factors [\(CLICK for risk factors\)](#). Almost all patients should receive some form of prophylaxis. Anticoagulant therapy is preferred over mechanical devices unless anticoagulants are contraindicated (See contraindications - below).

For the **highest risk** patients [\(CLICK for list\)](#) lacking contraindications to anticoagulation, low molecular weight heparin is the preferred agent. For all other patients, 5000 Units of unfractionated subcutaneous heparin every 8 to 12 hours is the preferred treatment.

Would you like to order any form of DVT prophylaxis at this time?

- Order unfractionated heparin 5000 U sq q 12 hours (preferred) (\$2/day)
- Order unfractionated heparin 5000 U sq q 8 hours (\$3/day)

Patient is in a [high risk](#) group and requires low molecular weight heparin now:

- Order enoxaparin 40 mg sq q day (preferred) (\$16/day)
- Order enoxaparin 30 mg sq q 12 hours (\$24/day)

Patient has a **contraindication to anticoagulation** and should receive mechanical prophylaxis:

- Order lower extremity sequential compression devices now: cost varies with size (\$35 - \$65)

Add elastic stockings?

- TED Hose - Knee High (\$4)
- TED Hose - Thigh High (\$7)

OR: Please provide reason below:

- I am not a physician, but I will contact physician responsible for this patient regarding DVT prophylaxis (tell physician to use "dvt prophylaxis advisor")
- Patient admitted for **labor or delivery** so heparin not ordered
- I do not wish to order DVT prophylaxis at this time because:

reason for not ordering:

Anticoagulation contraindications:

1. Active serious bleeding or bleeding in a critical location (e.g. intracranial)
2. Current or history of heparin-induced thrombocytopenia
3. Severe thrombocytopenia
4. Recent or scheduled procedure or operation with high bleeding risk
5. Presence of, or plans to insert epidural catheter

Current Date and Time: 11/27/2002 01:40 PM

Labs	Value	Date
PTT	42.3	11/27/2002 00:15 AM
INR	1.6	11/27/2002 00:15 AM
Platelet Count	149	11/27/2002 00:15 AM

NOTE: It is NOT appropriate to order PTT tests to monitor PROPHYLAXIS of DVT.

Submit Order or Reason

Return to WizOrder

1) Upon MD stating patient is eligible for protocol, WizOrder calculates heparin dose and makes it easy to order tests associated with guidelines

IV heparin for Confirmed PE in Adults



Guidelines for the treatment of Confirmed PE are listed below with calculated values in **RED** based on the patient's weight (77 kg)

- Bolus with heparin 80 U/kg I.V. [CONTRAINDICATIONS|LMW HEPARIN]
- Begin maintenance infusion of heparin at 18 U/kg/hr [CONTRAINDICATIONS|LMW HEPARIN]
- check PTT at 6 hour intervals to keep PTT in range of 65 to 110 seconds
- check platelet count daily [INFO ON HEPARIN INDUCED THROMBOCYTOPENIA]
- start warfarin therapy on day 1 at 5 mg and adjust to give INR of 2-3 [CONTRAINDICATIONS]
- stop heparin therapy after at least 4-5 days of combined therapy when INR is > 2.0 for 2 consecutive days
- continue warfarin treatment for at least 3 months at INR of

2) Links to educational materials available in protocol

3) MD reviews relevant medications & labs

Orders you may wish to consider (check to order) - Order only necessary items (duplicate order checking not done on this page).

- Bolus/rebolus with I.V. heparin (U) (80 x 77 = 6200 IU)
- Begin continuous infusion of I.V. heparin (U/hr) (18 x 77 = 1390 IU/hr)
- Check PTT q6 (starting 6 hours after bolus)
- Check platelet count qAM
- Begin warfarin p.o. at (mg/day) on (mm/dd/yy)
- check PT/INR qAM

I am not doing some/all suggestions above because:

Order the selected items

Clear selections

Cancel

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Current Date and Time: 04/12/2000 09:10 AM

Anticoag Meds	Dose	Date
No Anticoagulant Meds		
Labs	Value	Date
PTT	None available	
INR	None available	
Platelet Count	None available	
PCV	None available	

4) MD selects actions and clicks button to activate guideline-related orders

The VUMC Antibiotic Subcommittee recommends Cefepime (Maxipime ®) over Ceftazidime (Fortaz ®) for most indications where an anti-pseudomonal cephalosporin is needed.*

Cefepime 1000 mg q12h = Ceftazidime 1000 mg q8h

* Exception for neonates and selected pediatric patients. Safety and effectiveness of Cefepime in pediatric patients below the ages of 2 months have not been established.

Compared to ceftazidime, Cefepime has the following advantages:

Similar coverage against *Pseudomonas*, improved coverage against *Enterobacter* species

Enhanced stability against inducible/derepressed chromosomal beta-lactamases

Better activity against Gram-positive pathogens, including *Staphylococci*, *S. viridans*, *pneumococcus*

Q12 hour dosing except for empiric therapy for febrile neutropenia

[View Cefepime Fact Sheet](#)

[Go to Pediatric Recommendations](#)

[Go to Renal Dosing Recommendations](#)

Adults (Age > 16 years)

Dose	Example of Infection being treated
<input type="radio"/> 500 mg IV q12h	Uncomplicated urinary tract infection
<input type="radio"/> 1000 mg IV q12h	Nosocomial pneumonia in ICU patient
<input type="radio"/> 1000 mg IV q8h	Empiric coverage of febrile neutropenic patient
<input type="radio"/> 2000 mg IV q8h	The FDA approved a dose of 2 gm IV q8h for febrile neutropenic patients and this is preferred over the 1 gm IV q8h dose if cefepime is given as <u>monotherapy</u> for this indication. The 1 gm IV q8h dose has been used in the Bone Marrow Units and is appropriate for febrile neutropenic patients receiving other antibiotics with activity against Gram-negative aerobic pathogens such as aminoglycosides or quinolones. Documented infection with <i>Pseudomonas aeruginosa</i> should be treated with the higher (2 gm IV q8h) dose.

Other

Intramuscular	<input type="radio"/> order I.M. Cefepime (with Lidocaine)
Non-standard Dose	<input type="radio"/> order non-standard dose of Cefepime

[Order Cefepime](#)

[Start Over](#)

"Click" the CLOSE button to return to WizOrder without ordering cefepime

[Order Ceftazidime](#)

[Back](#)

[Home](#)

[Close](#)

Problem: Excess test ordering

**RUC = Resource Utilization Committee,
Eric Neilson, MD, Chair**

1. In December, 1999 RUC and DBMI used WizOrder to examine more closely patterns of test ordering.

February 2000 Most Common Tests Ordered at VUH, All WizOrder Wards

00648 === part thromboplastin (ptt) bld	** UNIT: 7n
00686 === osmolality bld	** UNIT: 11si
00686 === sodium bld	** UNIT: 11si
00715 === basic metabolic panel	** UNIT: 7smi
00753 === prothrombin time (pt) blood	** UNIT: 3n/c
00756 === basic metabolic panel	** UNIT: 7n
00763 === basic metabolic panel	** UNIT: 8s
00799 === cbc / plt ct	** UNIT: 3n/c
00821 === abg resp	** UNIT: 10n
01029 === basic metabolic panel	** UNIT: 11nm
01046 === basic metabolic panel	** UNIT: 3n/c
01084 === basic metabolic panel	** UNIT: 10n
01218 === cbc (wbc,rbc,hgb,pcv,ind)	** UNIT: 10n
01556 === abg resp	** UNIT: 3n/c

Chem7 (BUN, Creat, Lytes, Gluc = Basic Metabolic Panel) was identified as most commonly ordered test; and, in some ICU settings, daily CXRs were being done for weeks

Problem: Excess test ordering

2. Based on RUC discussion and deliberation:

- a. On Jan. 20th, 2000, WizOrder limited all radiology orders to “one time only”
- b. On Feb. 1, 2000, WizOrder limited all EKG orders to 1x or 2x (q8h)
- c. On Mar. 20, 2000, WizOrder limited LBCG to “only within 24 hrs”
- d. Subsequently, ordering of Comprehensive Metabolic Profile restricted

WizOrder: LBCG Ordering

WizOrder Popup

Lytes, BUN, Creatine, Glucose

Patient: 8001X Demo, Patient One (1111111-1) Click [here](#) for help.

1 Select test(s)

Na

K

Cl

CO2

BUN¹

Creat¹

Gluc

Graphs

Component	6 days ago	3 days ago	now
Na	145	141	138
K	5.0	4.3	3.8
Cl	105	111	112
CO2	30	20	25
BUN	25	26	13
Creat	1.5	0.8	0.6
Gluc	110	129	132

Graph color codes: Clinically high range Clinically normal range Clinically low range

NOTE(S): 1 Creat & BUN will be ordered "once, routine, now" if ordered via "Q??H" option.

2 Select timing/urgency

once, in am 05, routine

once, now, routine

3 Go to another page or exit

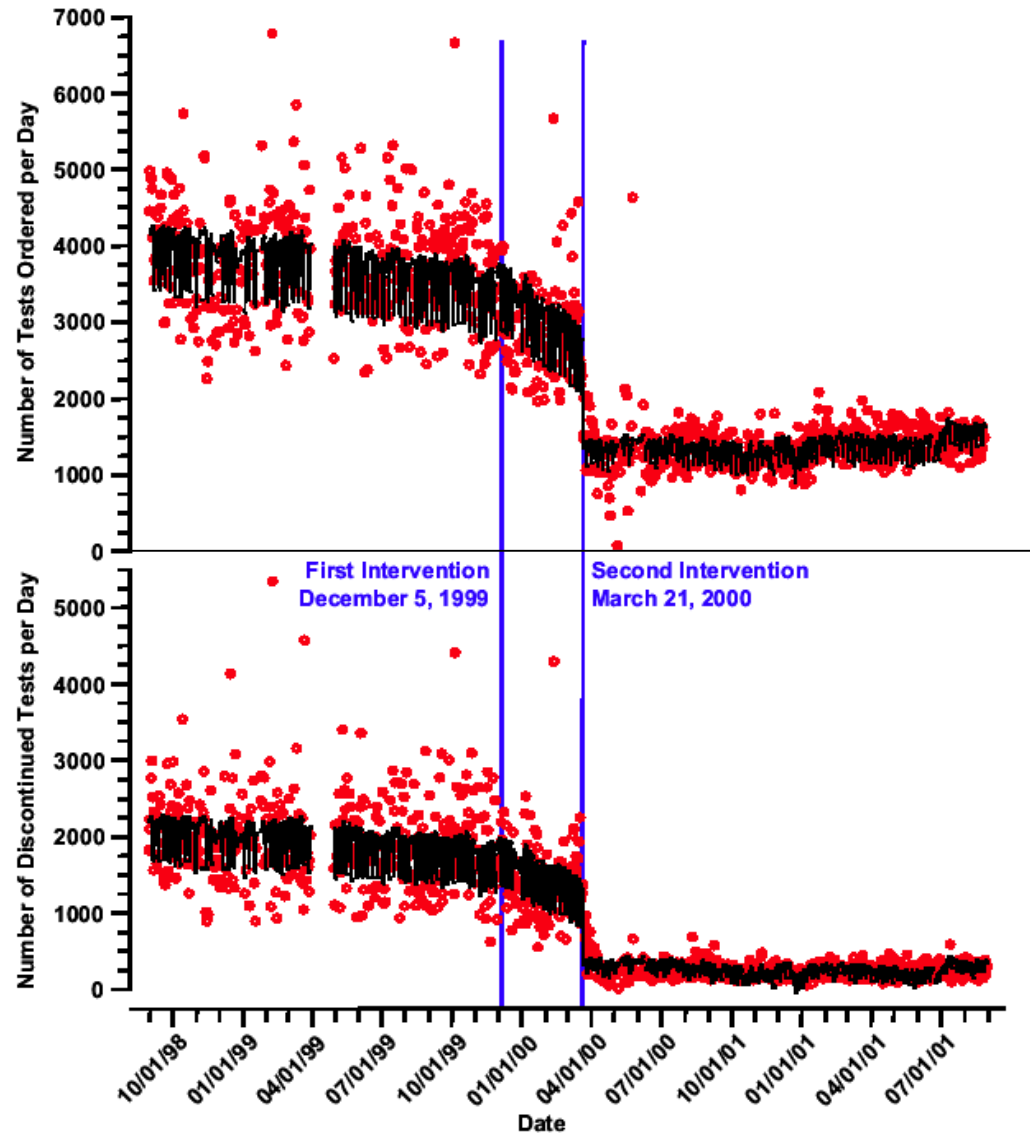
Results: Excess test ordering

1. Orders for Chem7 (BUN Creat Lytes Glucose) components and aggregate decreased 66% from baseline for previous year; actual tests performed decreased 40% from baseline.
2. Orders for portable CXR's decreased 40% from baseline; studies performed decreased 35-40%.
3. Orders for EKGs decreased 10% from before.

Neilson EG, et al. The Impact of Peer Management on Test-Ordering Behavior
Ann Intern Med. 2004. 41(3):196-204

Figure 3

Results: Excess test ordering



7016X ZTRAINSS7N, Greg 5000085-0 61y/o M

Admission »

Diagnosis »

Condition »

Vital signs »

Activity/limitations »

Allergies »

Nursing instructions »

Diet »

Medications »

IV fluids »

Laboratory tests »

Radiographic studies

Miscellaneous orders »

Bells and whistles »

ACYCLOVIR 5% OINTMENT:
 a) Dose or action: APPLY
 b) Route: TOPICAL
 c) How often: 5XDAY

**Intervention (PC-POETS) interface
 Decision Support Content**

When to start (first dose):

1 NEXT SCH (default) (next schedule)
2 NOW

or enter a start date and priority
 or press ENTER = NEXT SCH

GenRx
 WizRx
 \$55.45
 literature
 QMR
 antibiotics

**Control (standard) interface
 Decision Support Content**

Interface Layout Copyright © 1999-2004,
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Figure 1.

Table 3. Opportunities and Response Rate Ratios during the clinical trial.

Opportunity Code	Decision Support Opportunities		Decision Support Responses		Adjusted Response Rate Ratios*	
	Control	Intervention	Control	Intervention	Ratio	95% CI
ABA	396	448	1	2	2.90**	.059 – 140
MSH	15,116	20,886	2	57	13.4	3.0 – 59
WRX	45,596	61,311	3	43	9.67	2.2 – 43
MSB	45,421	61,359	2	57	21.2	4.3 – 100
QMR	15,115	20,908	1	51	32.7	3.3 – 320
TRD	32,234	42,631	0	50	†	
LMR	24,357	32,961	9	39	3.11	1.1 – 8.7
Overall	178,235	240,504	18	278	9.72	4.7 – 20

*Ratio of decision support opportunity response rates for intervention subjects over control subjects; **not significant; †Could not calculate a ratio.

Reference: Rosenbloom ST et al. J Am Med Inform Assoc. 2005. 12(4):458-473

WizOrder Development History

Key concepts:

System implementation represents a profound workflow change for users

Users' concerns must be continuously respected, listened to, and addressed.

Development: Social History

- **May 1994 - 3 pilot wards use joint OE system**
- **June 1994 - Early implementation problematic**
- **RM&AG work as medical ward clerks 2 weeks**
- **New iterative design with house staff input: Pizza dinners, moonlighting wages, real orders**
- **Stable design after 4 months: 9/94 to 12/94**
- **Institutional permission to use new interface, 2/95**

Development: Social History

- **Training, support by User Analysts & System Support Services; DBMI, Clinical leaders & Administration participated**
- **Implemented first unit, CCU 4/95; MICU, BMT 9-10/1995; Adult Medicine & Surgery 1996; Pediatrics & OB/Gyn 1997**
- **Clinical informatics service: Care for system & users in same manner as a patient**

MD rounds, on-call, UA/SSS, weekly clinical informatics conferences (pizza luncheons)

Rationale for Change: The Medical Record over the past 5,000 years

EXAMINATION

V 10-11



Translation

nest a man having a break in the column of]

Rationale for Change: The Medical Record over the past 5,000 years

Case Reports

PATIENT 1

A 19-year-old woman was well until July 1985, when she had onset of fever, weight loss, facial rash, alopecia, and arthritis in her knees and ankles. The diagnosis of systemic lupus erythematosus was made on the basis of the clinical and laboratory findings (23), and she was treated with prednisolone, 150 mg/d. Although the patient's condition improved slightly, the dosage could not be reduced to below 75 mg/d. Additional therapy with azathioprine, 150 mg/d, and cyclosporine, 5 mg/kg body weight, had no beneficial effect.

In February 1986 her condition deteriorated, and she presented with fever, arthritis, malar rash, and severe dyspnea on exertion. Physical examination showed cachexia, pallor, facial rash, and tenderness in the knee joints. Despite maintenance of prednisolone she developed severe respiratory insufficiency with diffuse infiltrates in both lobes. Other symptoms included apathy, disorientation, renal failure, hemolytic anemia, and thrombocytopenia (Table 1). Despite antibiotic and antifungal treatment her respiratory capacity worsened and she required assisted ventilation. Repeated attempts to identify an infectious agent were negative, and the transbronchial histologic examination was consistent with the diagnosis of lupus pneumonitis.

We decided to institute large-volume plasmaphereses with subsequent application of pulse cyclophosphamide. Plasma, 60 ml/kg body weight, was exchanged via hollow fiber membrane filters with immunoglobulin-free 4% albumin solution on days 1, 2, and 3. Pulse cyclophosphamide, 12 mg/kg body weight, was applied on each of days 3, 4, and 5; the first infusion was given 6 hours after the third plasmapheresis. Thereafter, oral cyclophosphamide was administered at a dosage of 2 mg/kg body weight. In addition, prednisolone, which had been withdrawn for 7 days to restore the B-cell proliferation capacity, was reinstated on day 5 at 2 mg/kg body weight. Prednisolone was gradually tapered off and withdrawn at month 6.

The patient's condition improved rapidly. The infiltrates in both lungs subsided after 6 days and disappeared almost completely within 16 days. Blood urea nitrogen and creatinine levels became normal. There was a parallel progressive rise in hemoglobin and platelet count. Low levels of C4 and of complement-

The first major change in the medical record over the past 5,000 years

VUMC MARS Patient Record - Netscape

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Bookmarks Netsite: http://mars.mc.vanderbilt.edu/40/cgi-bin/mars/mars.cgi?spread=14

Show demographic Lab links Previous searches: 00000032 White, Snow 00000031 Dwarf, Happy

White, Snow MR#: 00000002 DOB: 02/19/17 Sex: F

24HLab	Coag	Transf	MetChem	Other Chem	InvasPath	Endocrine	MiscLab	From:
CBC	BancMetab	UA/Banc	Microbiol	OtherHemat	SPEP	DrugLevels	Flow	to: 03/04/1999
Differential	CompMetab	UAMicrosc	Virology	OtherCoag	BloodBank	Toxicology		3 days 7 days OK
Abbr: Diff	BancChem	BloodChem	GenDiagn	OtherGenet	BodyFluid	Genetic	ASBResult	

08/10/1998 DS
 11/28/1995 REP Echocardiography
 11/23/1995 RAD CTCH1
 11/22/1995 RAD CHST2
 08/17/1995 REP Echocardiography

ALL TYPES 95 96 97 1998XJASOND
 Problems

Expand/contract (click on a number to display reports)

Confidential patient information -- please dispose of appropriately. Generated for test@b.

White, Snow MR#: 00000002 DOB: 02/19/17 Sex: F

BasicMetab	Na	K	Cl	CO2	BUN	Gluc
Ref. range:	135-145	3.5-5.0	95-105	23-30	5-25	70-110
Units:	meq/L	meq/L	meq/L	mmol/L	mg/dL	mg/dL
10/31/95 14:47	137	4.6	98	26	42*	96
10/24/95 16:24	141	4.3	100	27	33*	100
10/02/95 14:35	140	4.2	100	28	26*	79

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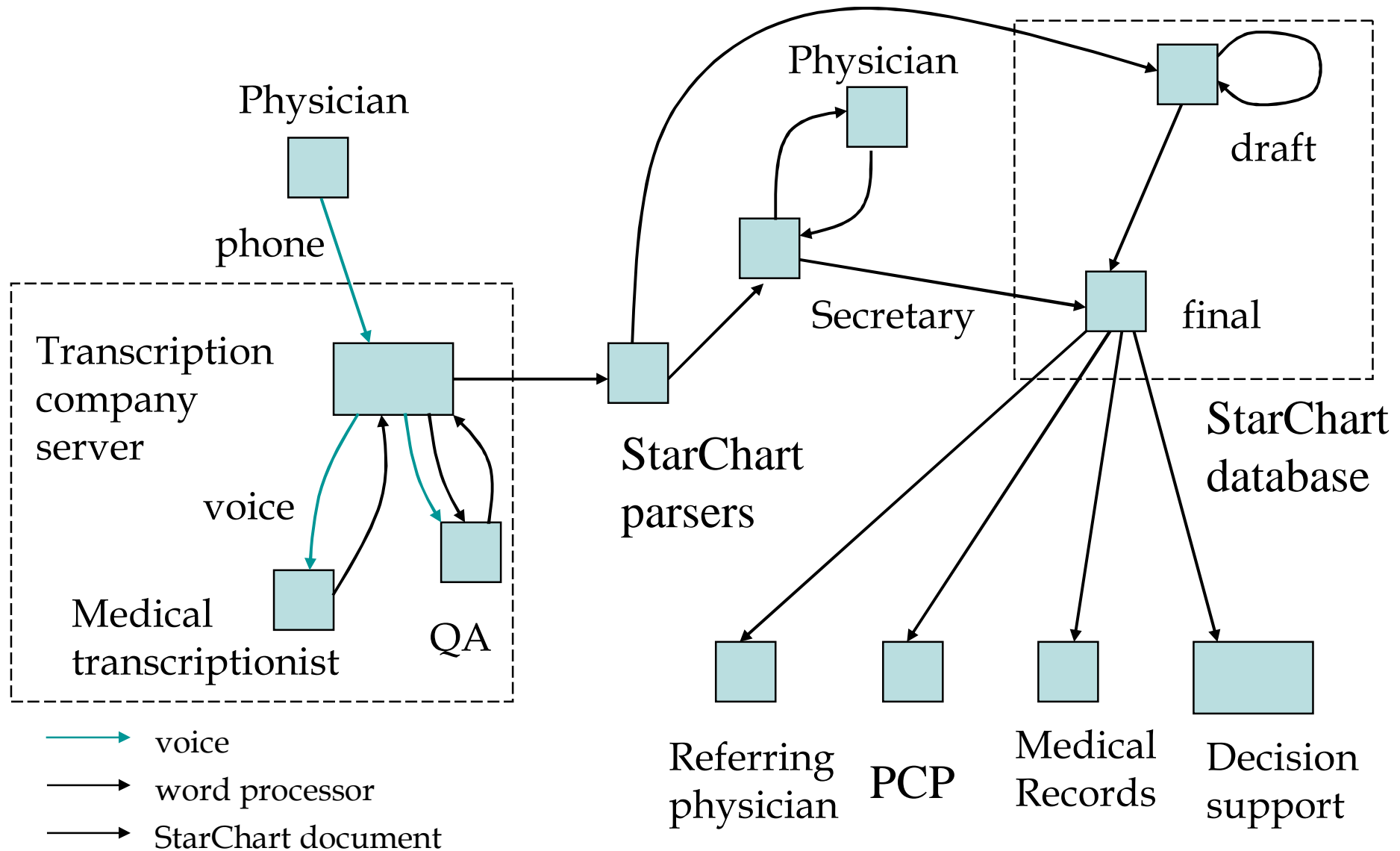
Role of new technology: opportunity for NEW processes, not just replication of old processes using computers

1. Single-facet HIS (electronic chart; electronic order entry) concentrates on the smaller portion of the problem.

2. Communication among providers
(and between patient and provider) is the dominant cost
[Coiera E. When conversation is better than computation.
JAMIA 2000;7:116-24] in health care.

3. Support for inter-personal communication needs to be focus for future HISs.

A Document's Information Flow: from D. Giuse, J. Jirjis



Conclusion

**Diseases desperate grown
By desperate appliance are relieved,
Or not at all.**

William Shakespeare, 1600; *Hamlet*, Act: IV, Scene: iii

