Elements of CPOE Style: A Guide to Formatting Text for Clinician Users

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Setting & Challenge

- CPOE becoming more common → rapidly-increasing prescriber "face-time" with computers
- Increasing recognition of unintended consequences of CPOE (Ash, 2007)
  - More or new work for prescribers
  - Workflow mismatches
  - New kinds of errors
- We believe well-formatted text can → improve usability & ease-of-use

  → improve adoption

  → accuracy → safety

Under-Appreciation of Formatting

- Pressure to install CPOE
  - Basic performance (e.g. software, hardware) & functionality given higher priority
- CPOE often installed/configured by non-prescribers
  → Less familiar with prescribers' mental processes
  - Filtering of information (What needs to be shown? What does NOT need to be shown?)
  - Language / jargon
  - Time pressure / urgency to find information
    - High value of fewer words, fewer clicks
- Lack of style guide

Goals & Principles

- Lofty goals: extra care in text formatting can actually…
  1. Help user find desired information
  2. Add meaning beyond literal words
- Design principles
  - Applicable to all levels of text in CPOE
    - From individual orderables
    - To complicated pop-up advisors
  - Evolved and proven helpful throughout our CPOE experience (Duke Univ. Hospital, North Carolina, USA)

Help User Find Desired Information

- Focus on <u>keywords</u>
  - Favor bringing keyword to the margin
  - Creates natural organization

BEFORE	AFTER
VENTILATOR 8. pc/ps mechanical ventilation + emergency (fio2 100%) backup mechanical ventilation 9. qam compliance study by rt	VENTILATOR 8. mechanical ventilation: pc/ps mode + mechanical ventilation: emergency (fio2 100%) backup 9. compliance study by rt qam
Complicated Urinary Tract Infection (Peds)	Urinary Tract Infection: Complicated (Peds)

Help User Find Desired Information (Cont'd)

- Take advantage of conventions & abbrev'ns
  - Ideal if prescriber can select abbrev'ed version (input) but nurse receives more explicit version (output)
  - As used profusely in written charts (for good reasons, mostly)
  - Choose standard English conventions: avoid IT jargon
  - Choose familiar (or at least logical) abbrev'ns

BEFORE	AFTER
6. nurse: complete diabetic flowsheet with each glucose measurement + nurse: teach patient and family to check blood sugars, draw insulin, and give insulin + teach family signs & symptoms of hypoglycemia, and treatment of hypoglycemia + nurse: teach family how to administer intramuscular injection (glucagon prn)	6. record each glucose measurement on diabetic flowsheet + teach checking glucose & giving subq insulin + teach s/sx & tx of hypoglycemia & giving im glucagon
17. nursing: collect aliquot (10-20 ml) of each void and label with time. if frank hematuria is present, notify h.o.	17. collect & label aliquot each void; notify if hematuria

Help User Find Desired Information (Cont'd)

- Visual alignment must reflect hierarchy of info
  - Essential for quick navigation to information sought
  - Beware line wrapping
  - Assume user looking for visual patterns more than reading literal text
- Organize text with brief headers
  - Concise use of ALL CAPS can help navigation

BEFORE	AFTER
Nitrates 17. nitroglycerin 2% oint [nitro-bid] topical ntg x28 days off from midnight to 0600 18. nitroglycerin infusion (100mg/250ml) iv cont now x5 days -titrate up until chest pain relieved or systolic bp <100 mmhg; requires stepdown status 19. nitroglycerin sublingual [nitrostat] 0.4 mg subling q5mprn prn x28 d for chest pain per chest pain protocol 20. all formulary nitrates » Beta-blockers	NITRATES 17. nitroglycerin 2% oint [nitro-bid] topical ntg x28 days off from 18. nitroglycerin infusion (100mg/250ml) iv cont now x5 days 19. nitroglycerin sublingual 0.4 mg sl q5min x3 prn chest pain per 20. all formulary nitrates >> BETA-BLOCKERS

Add Meaning Beyond Literal Words

- Consistency of format
  - Different format implies different meaning (even when not true)
  - Internal/local (especially within field of vision) consistency more important than

BEFORE	AFTER
Non-cardiac: 17. cefuroxime inj [zinacef] 50 mg/kg/dose iv q8h x2d + gentamicin inj [garamycin] 3.5 mg/kg/dose iv q24h x99d Cardiac closed chest: 18. cefuroxime inj [zinacef] 50 mg/kg/dose iv q8h x 2 days	Non-cardiac: 17. cefuroxime inj [zinacef] 50 mg/kg/dose iv q8h x2d + gentamicin inj [garamycin] 3.5 mg/kg/dose iv q24h x99d Cardiac closed chest: 18. cefuroxime inj [zinacef] 50 mg/kg/dose iv q8h x2d
RADIOLOGY (if fluctuant) ultrasound of affected area (if history of trauma) plain radiograph	RADIOLOGY (if fluctuant) ultrasound (if history of trauma) plain radiograph
23. expressed breast milk (no adds) po 24. expressed breast milk (with additives)	23. expressed breast milk (no additives) 24. expressed breast milk (with additives)

Add Meaning Beyond Literal Words (Cont'd)

- Structure conveys relationships
  - Similar structure implies similar meaning (thus words are not needed to state the relationship)

BEFORE	AFTER
Consider Pediatric Infectious Diseases consult if: **Immunocompromised patient, alternative antibiotics needed for allergies, comorbid conditions, clinical failure after 48 hrs of treatment** **17. pediatric infectious disease consult** **Consider Pediatric General Surgery consult if:** **Parapneumonic effusion, necrotizing pneumonia, abcess** **18. pediatric general surgery consult**	**CONSULTS** **If immunocompromised, allergic & needing alternative antibiotics, comorbid conditions, clinical treatment failure after 48 hrs:** **17. pediatric infectious disease consult** **If parapneumonic effusion, necrotizing pneumonia, abscess:** **18. pediatric general surgery consult**

Add Meaning Beyond Literal Words (Cont'd)

- Align common text
  - Highlights differences
  - Natural pattern recognition brings the choices into focus

BEFORE	AFTER
1. peds hem-onc admission (if not already done) >> 2. peds line draw (if not already done) 3. enter bsa (if not already done) 4. enter dosing weight (if not already done)	1. (if not already done) peds hem-onc admission >> 2. (if not already done) peds line draw 3. (if not already done) enter bsa 4. (if not already done) enter dosing weight
3. weight: obtain on admission (in kg) 4. weight (kg): estimate only & defer measurement	3. weight (kg): obtain on admission 4. weight (kg): estimate only & defer measurement
43. nutrition consult for evaluation of intake 44. nutrition education consult 45. nutrition evaluation consult	43. nutrition consult: evaluation of intake 44. nutrition consult: education 45. nutrition consult: evaluation

Conclusion

- The human eye and mind can recognize (& infer meaning from) patterns readily. Take advantage of that.
- Present information in the way that it is expected → Less interpretation → Less cognitive load → More safety & satisfaction
- Saying the same thing with fewer words improves signal-to-noise ratio.
- Well-formatted text can make a difference.

- Reference:
  - Ash et al, 2007. Unintended Consequences Related to CPOE. *JAMIA* 14(4): 415-23.

- Acknowledgements:
  - Mentors: James Tcheng MD & Michael Russell MD
  - Tremendous work by entire Duke CPOE team

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