



Prospective Validation of the MET-AP Clinical Decision Support System for Pediatric ED Triage of Acute Abdominal Pain

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Background

- Abdominal pain is a common childhood complaint
- Reaching an ED disposition decision can be difficult and time-consuming
 - large list of possible diagnoses to consider
 - inexperienced physicians have difficulty assessing children and recognizing patterns of presentation
 - lack of simple diagnostic tests or prediction scores
- MET-AP (*Mobile Emergency Triage – Abdominal Pain*) was developed to assist physicians in triaging patients by suggesting which direction to take:
 - consult General Surgery for probable appendicitis
 - discharge, F/U as needed for benign/resolving causes
 - observe/investigate for other causes
- Clinical Decision Support is based on 13 historical, physical exam or lab attributes easily determined and entered into a PDA during initial assessment
- Complex algorithm generates an estimate of how closely the patient matches each of the categories
- MET-AP is not a diagnostic tool, nor does it replace U/S or other tests

Objectives

- To determine the accuracy of MET-AP in recommending the correct triage category
- To compare MET-AP accuracy to physician/resident accuracy in predicting the correct triage category
- To determine the inter-observer agreements between physicians and residents for evaluating patient attributes

Methods

- Prospective ED cohort study recruiting patients (1-16y) 24/7 with acute abdominal pain (<10d duration)
- Informed written consent for patient data collection and telephone follow-up obtained
- Observers completed data entry on PDA with as many attributes as deemed necessary and identified a prediction of the most appropriate triage category
- Where possible, 2 independent observations by physician/resident or resident/physician were completed
- Telephone/chart follow-up at 14 days to determine final diagnosis and corresponding correct disposition
- All personnel blinded to MET-AP triage recommendation until final patient disposition determined
- Sample size calculated to estimate accuracy within 5%, 19 times out of 20, required 384 patient assessments, assuming accuracy is 50% (estimate based on literature evidence of junior Emergency physician accuracy at this early stage of assessment)



Patient Characteristics

Characteristic	Approached (n=631)	Not Approached (n=467)	p-value
Mean Age (SD)	9.23 (4.01)	9.48 (4.42)	0.349 *
% Male	48.7%	47.6%	0.760 *
Final Triage Category			
Discharge	76.4%	71.9%	0.238 #
Observation	13.1%	15.2%	
Consult	10.5%	12.9%	

* Student t-test # Fisher's exact test # Chi-square test

Triage Accuracy for Correct Disposition

	Staff Physician (n=457)	Resident (n=339)
MET Recommendation	67.2% (95% CI: 62.7, 71.3)	63.4% (95% CI: 58.2, 68.4)
Physician Prediction	70.2% (95% CI: 65.9, 74.2)	62.8% (95% CI: 57.6, 67.8)
Difference	-3.0%	0.6%

Inter-observer Agreements (n=222)

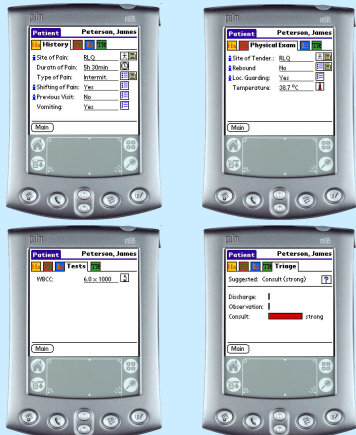
Characteristic	Inter-observer Agreement (95% CI)	Method
Site of Pain	0.513 (0.409, 0.617)	K
Duration of Pain (hours)	0.918 (0.893, 0.937)	ICC
Duration of Pain (category)	0.825 (0.751, 0.900)	K
Intermittent vs Constant	0.475 (0.356, 0.594)	K
Shifting of Pain	0.521 (0.362, 0.680)	K
Previous ER Visit	0.481 (0.128, 0.834)	K
Vomiting	0.890 (0.829, 0.951)	K
Site of Tenderness	0.573 (0.467, 0.679)	K
Rebound Tenderness	0.449 (0.266, 0.632)	K
Localized Guarding	0.309 (0.139, 0.479)	K
Temperature (°C)	0.970 (0.961, 0.977)	ICC
Temperature (categorized)	0.945 (0.902, 0.989)	K
Total WBC	0.942 (0.891, 0.970)	ICC
WBC (Categorized)	0.952 (0.860, 1.000)	K

K = Kappa statistic for categorical data
ICC = Intra-class correlation coefficient for continuous data

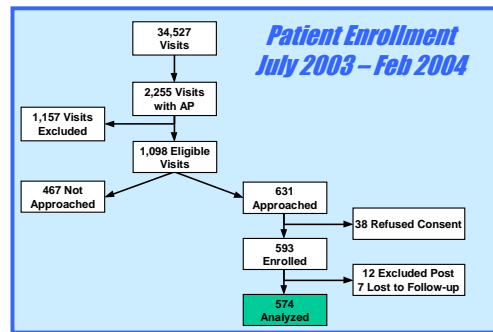
Discussion

- This is one of the first clinical trials to assess the clinical reliability of a decision support system implemented in a live ED environment and used by a large and diverse group of physicians (>100)
- Accuracy of the MET-AP triage recommendation was calculated considering only the recommendation with the highest score. The system provides a score for all 3 categories, mimicking the way physicians think
- MET-AP has poor accuracy for the *Observation* category, likely due to the diverse range of cases included
- As expected, the inter-observer agreement between staff physicians and residents was poorest for rebound tenderness and involuntary guarding. Further analysis is needed to determine if this ambiguity affects the system's overall accuracy, and which observer should be considered the gold standard
- The quality and completeness of data collected during the trial is far superior to the retrospective data used to develop the MET-AP triage algorithm. A modified algorithm based on this prospective data should yield improved accuracy
- WBC was collected for <25% of patients and likely does not add to the overall accuracy. A new algorithm without WBC will be developed and tested, and if successful, will make the system truly usable *anytime and anywhere*
- Future studies will evaluate the system in other settings (community ED, FP office), assess physician acceptance of recommendations, and study the system's impact on patient outcomes and cost through a RCT

Samples of History, Physical, Laboratory and Triage Interface Screens



Results



Conclusions

- MET-AP can recommend the correct triage category with similar accuracy to physicians and residents
- Most attributes have moderate to significant inter-observer agreement

Acknowledgements

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Website

www.mobiledss.uottawa.ca