System 1 and System 2 Clinical Reasoning Performance by Block and Longitudinal Integrated Clerks in a Structured Clinical Oral Internal Medicine Clerkship Examination

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Background - Definitions

Clarifying Assumptions to Enhance Our Understanding and Assessment of Clinical Reasoning

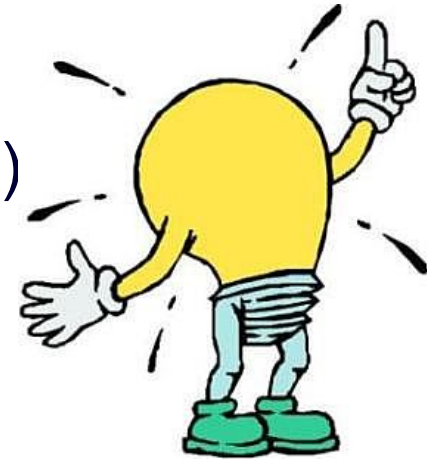
Steven J. Durning, MD, PhD, Anthony R. Artino, Jr, PhD, Lambert Schuwirth, MD, PhD, and Cees van der Vleuten, PhD

Acad Med. 2013;88:442–448.

"Deciding on a diagnosis and instituting a treatment strategy are foundational to the practice of medicine. There is no question that developing competence in these processes, which are referred to loosely as "clinical reasoning" is essential for physician success."

Background - Two Types of Clinical Reasoning (Croskerry, *Acad Med* 2009)

- Intuitive Approach (System 1)



- Analytical Approach (System 2)

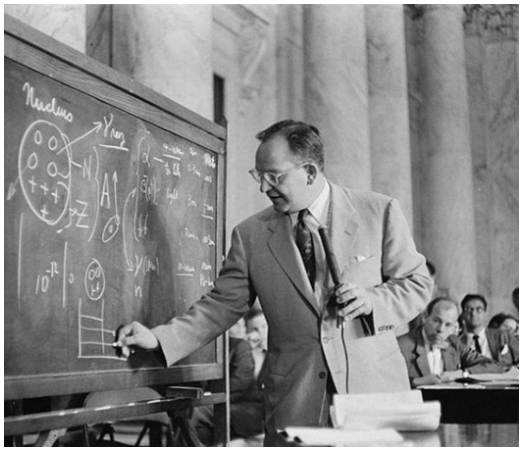


Table 1

Principal Characteristics of Type 1 and Type 2 Decision-Making Processes*

Cognitive style	Type 1 Heuristic, intuitive	Type 2 Systematic, analytical
Computational principle	Associative	Rule based
Responsiveness	Passive	Active
Capacity	High	Limited
Cognitive awareness/control	Low	High
Automaticity	High	Low
Rate	Fast	Slow
Reliability	Low	High
Errors	Relatively common	Rare
Effort	Low	High
Emotional attachment	High	Low
Scientific rigor	Low	High

* Adapted from: Croskerry P, Norman GR. Overconfidence in clinical decision making. Am J Med. 2007;121:S24–S29. Used with permission.[45]

Background

- Clinical reasoning and clinical decision making are skills that are perceived to be vital for the practice of medicine, but have received more emphasis at the postgraduate training level.
- Assessment of medical student performance in these domains in high stakes clerkship examinations has not been widely reported
- Student ability in clinical reasoning at the clerkship level is not well understood and differences between Block and Longitudinal trained clerks have not been explored

Background

- A Structured Clinical Oral (SCO) examination developed to examine, in part, clinical reasoning skills
- Consists of eight 9-minute stations
- In 3 stations, students interact one-on-one with examiners in structured case discussions that test Clinical Reasoning Skills around the diagnosis and/or management of a patient

Background – Sample Stem

A 66-year-old man presents to the Emergency Department with generalized malaise after having had severe watery diarrhea for 5 days during the past week. The diarrhea resolved completely 2 days ago but his malaise persists with some postural lightheadedness. The patient was entirely well before the onset of the diarrhea. The patient's only past medical history was that of well treated hypertension for the past 20 years with Ramipril 10 mg po od.

The emergency physician has obtained the following basic bloodwork: CBC: Hb 165, WBC 8.2, Platelets 250; Serum Lytes: Na 146, K 4.3, Cl 111, HCO3 24, Creatinine: 320, Glucose: 6.6. The CBC, electrolytes and creatinine were all known to be normal 1 month ago during a visit to the family MD. You see the patient after the Emergency Department physician refers him for the evaluation of the elevated creatinine.

Please anticipate being asked about history, physical examination findings, and investigations needed to reach a diagnosis.

Background – Sample Questions

System 1 (Intuitive):

"What is the most likely diagnosis?"

Acute kidney injury due to volume contraction secondary to diarrhea

System 2 (Analytical):

"What is the differential diagnosis?"

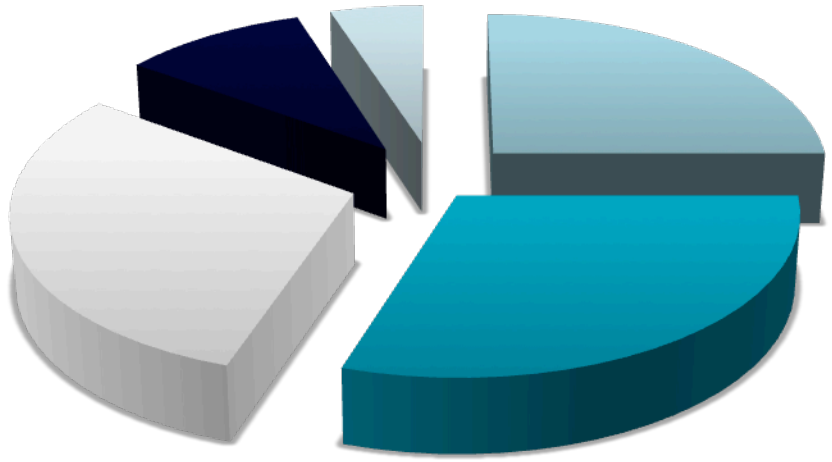
Glomerulonephritis, Acute interstitial nephritis, Obstructive Uropathy

Global:

G3. Integration & Analysis of Data (Problem Solving)

Background – Structured Clinical Oral Examination

Assessment Scheme:
Internal Medicine Clerkship



- Structured Clinical Oral 25%
- Written Examination 30%
- Work-Based Ward Assessment 30%
- Work-Based Ambulatory Clinic Assessment 10%
- Evidence Based Medicine Assessment 5%

Objectives

- Determine how student performance on the Clinical Reasoning portion of their examination correlated to and compared with their performance on the other components of the clerkship assessment scheme
- Determine student performance in Type 1 (intuitive) and Type 2 (analytical) Clinical Reasoning tasks and how these correlated with performance on the other components of the clerkship assessment scheme
- Compare Clinical Reasoning performance between Block and Longitudinally trained clinical clerks

Methods (1)

- Simple descriptive statistics of student performance in components of the SCO (the 3 Clinical Reasoning Stations alone, and the total SCO performance) and other assessment modalities were computed for all students taking the “C” clerkship rotation exams in the academic years 2014-15 and 2015-16

  (N = 27 LIC, and N = 48 Block clerks)

- Pearson correlation coefficients were calculated to examine the relationship between student performance in the Clinical Reasoning SCO stations and each of: student written examination performance, ward performance, and ambulatory clinic performance

Methods (2)

- Further descriptive statistics for student performance in Type 1 (intuitive pattern recognition) tasks, in Type 2 (analytical) tasks, and on Global Rating Scales of Clinical Reasoning, were calculated

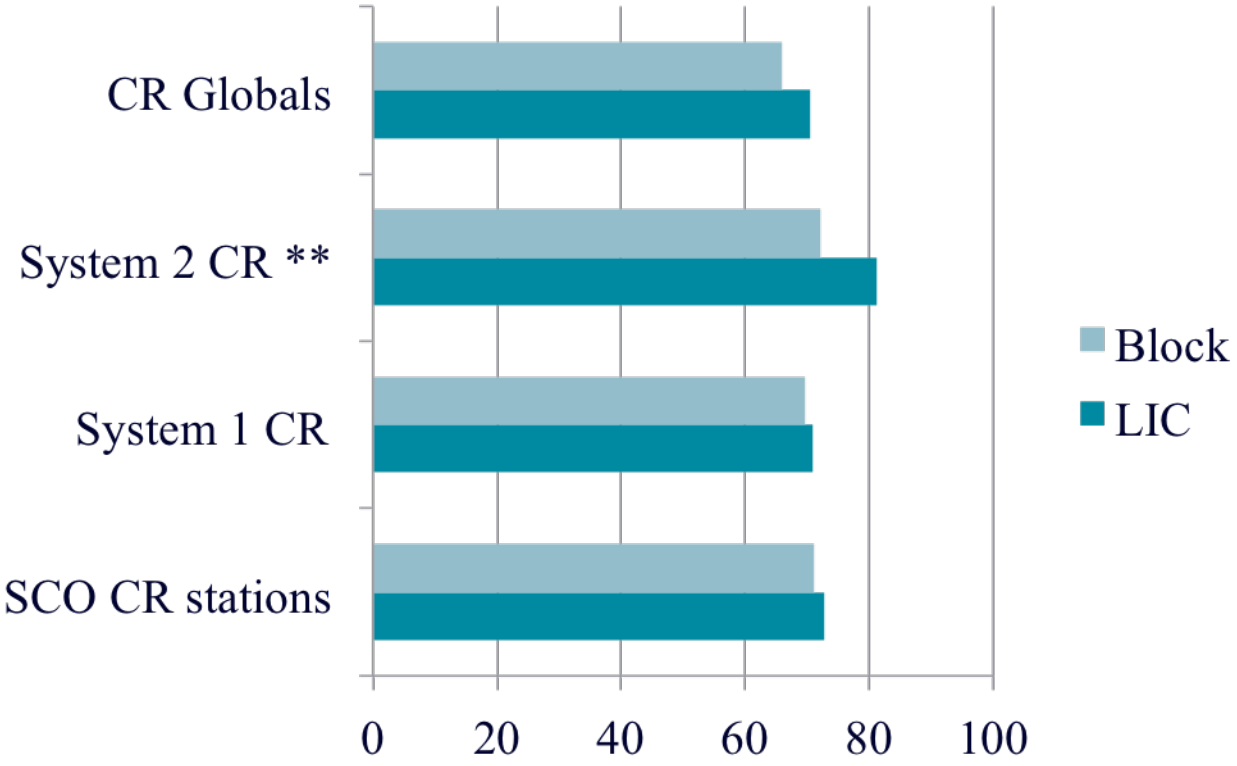
- T-tests were used to assess for differences between LIC clerks and Block clerks

- Pearson correlation coefficients were calculated to examine the relationship between students' performance in these components and the traditional assessment domains

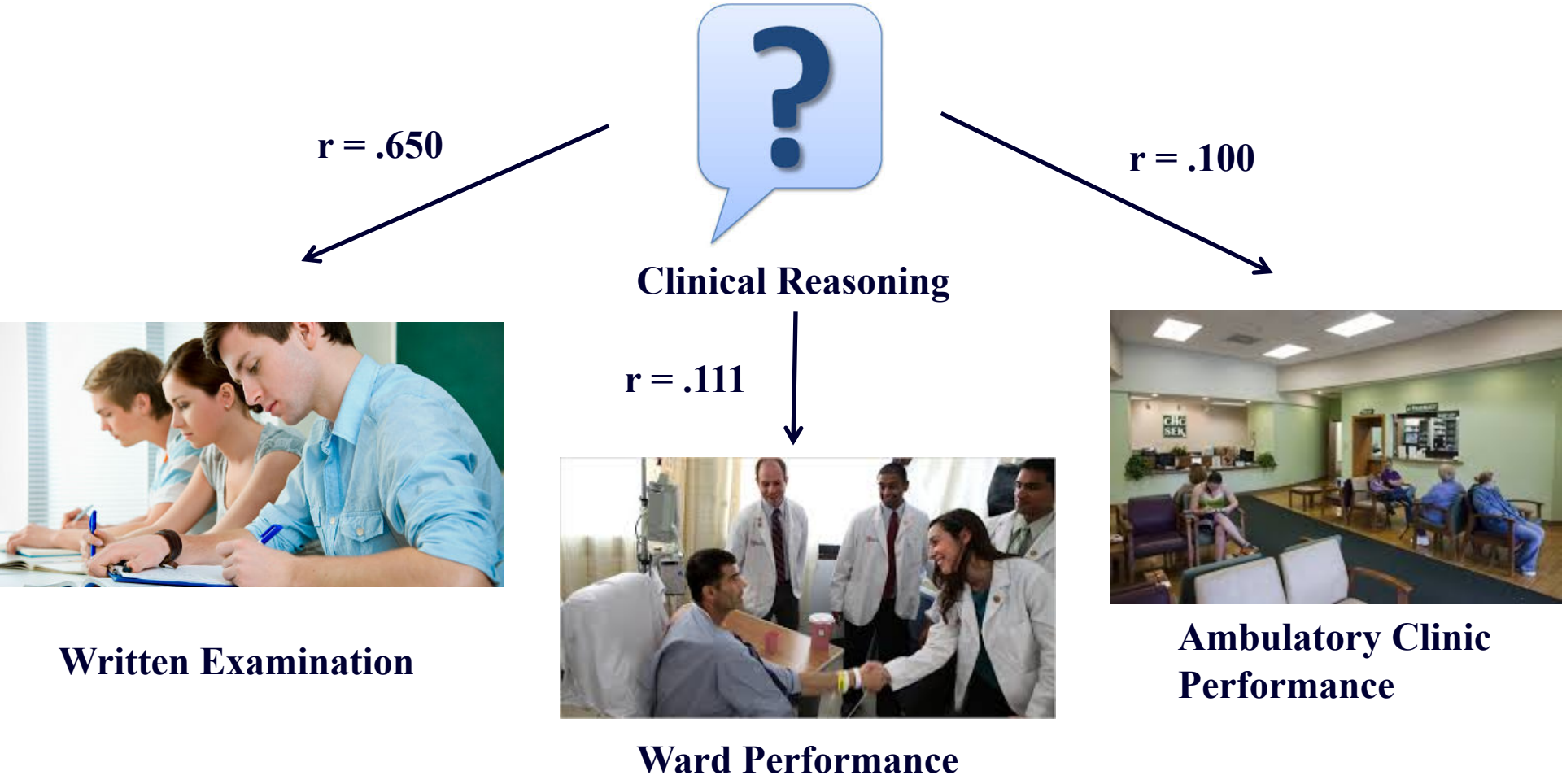
Results - Mean Marks Achieved in Assessment Components of the Internal Medicine Clerkship

Assessment Component	Mean % (n=75)	+/- SE %	LIC % (n=27)	Block % (n=48)
Structured Clinical Oral Examination (3xCR stations)	71.67	0.73	72.80	71.04
Written Examination	75.22	0.75	75.82	74.89
Ward Based Workplace Assessment	83.60	0.39	83.94	83.40
Ambulatory Clinic Based Workplace Assessment	81.07	0.41	81.61	80.76
Overall Rotation Assessment	79.33	0.38	79.93	79.00

Results Mean Performances in Clinical Reasoning



Results – LIC Correlations: Clinical Reasoning Performance & other Assessment Components



Results – LIC Correlations (Pearson Coefficients) Between Clinical Reasoning and Other Assessments

LIC	Clinical Reasoning SCO	System 1 Reasoning	System 2 Reasoning	Clinical Reasoning Globals
Final Mark	.752	.647	.082	.608
Ward Mark	.111	-.024	-.098	.076
Written Examination Mark	.650	.611	.147	.563
Ambulatory Clinic Mark	.100	-.003	.259	,104

Results – Block Correlations (Pearson Coefficients) Between Clinical Reasoning and Other Assessments

Block	Clinical Reasoning SCO	System 1 Reasoning	System 2 Reasoning	Clinical Reasoning Globals
Final Mark	.598	.428	.551	.519
Ward Mark	.078	.209	.083	.056
Written Examination Mark	.445	.284	.457	.378
Ambulatory Clinic Mark	.086	-.147	.068	.127

Conclusions

- LIC clerks outperformed Block clerks on all assessment modalities over 2 years in the Internal Medicine clerkship (but NS)
- Performances on CR domains LIC also better than Block but only System 2 reasoning ($p<.01$)
- LIC clinical clerk performance in assessments of Clinical Reasoning correlated best with overall performance on the rotation ($r = .752$) and performance on the written examination ($r = .650$)

Conclusions

- Block clinical clerk performance in assessments of Clinical Reasoning also correlated best with overall performance on the rotation (r = .598) and performance on the written examination (r = .445)
- Performance in System 2 analytical reasoning was the major difference between LIC and Block clerks.
  - LIC clerks were better than block clerks in this modality ($p<.01$)
  - There was poor correlation with this modality and written exam performance (r = .082), a major marker for knowledge
- This suggests that LIC clerks of all knowledge capabilities are better at analytical clinical reasoning, and may make better use of this technique whether they are more or less knowledgeable than their peers

Conclusions

- Type 1 (intuitive) Clinical Reasoning appeared to correlate strongly with overall clerkship performance and written examination performance
- Type 2 (analytical) Clinical Reasoning correlated poorly with the other assessment components. This may indicate that this domain measures a separate and unique ability. Students who displayed relative increased strength in this domain may, indeed, be resorting to analytical thinking as a fall back strategy. They appear to be weaker overall and appear to not do as well in the other assessment components