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Original Contribution

"Sick" or "not-sick": accuracy of System 1 diagnostic reasoning for the prediction of disposition and acuity in patients presenting to an academic ED☆,☆☆

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ABSTRACT

Objective: System 1 decision-making is fast, resource economic, and intuitive (eg, "your gut feeling") and System 2 is slow, resource intensive, and analytic (eg, "hypothetico-deductive"). We evaluated the performance of disposition and acuity prediction by emergency physicians (EPs) using a System 1 decision-making process.
Methods: We conducted a prospective observational study of attending EPs and emergency medicine residents. Physicians were provided patient demographics, chief complaint, and vital sign data and made two assessments on initial presentation: (1) likely disposition (discharge vs admission) and (2) "sick" vs "not-sick". A patient was adjudicated as sick if he/she had a disease process that was potentially life or limb threatening based on pre-defined operational, financial, or educationally derived criteria.
Results: We obtained 266 observations in 178 different patients. Physicians predicted patient disposition with the following performance: sensitivity 87.7% (95% CI 81.4-92.1), specificity 65.0% (95% CI 56.1-72.9), LR+ 2.51 (95% CI 1.95-3.22), LR− 0.19 (95% CI 0.12-0.30). For the sick vs not-sick assessment, providers had the following performance: sensitivity 66.2% (95% CI 55.1-75.8), specificity 88.4% (95% CI 83.0-92.2), LR+ 5.69 (95% CI 3.72-8.69), LR− 0.38 (95% CI 0.28-0.53).
Conclusion: EPs are able to accurately predict the disposition of ED patients using system 1 diagnostic reasoning based on minimal available information. However, the prognostic accuracy of acuity prediction was limited.

1. Introduction

Accurate and appropriate diagnosis is the most important aspect of clinical reasoning [1]. In the emergency medicine setting, physicians are frequently required to make diagnostic, therapeutic, and management decisions of acute illness or injury based on limited information about the patient and the encounter [2,3].

Faced with the prospect of a busy emergency department (ED) with several undifferentiated patients at different stages of their evaluation, rapid recognition of illness is paramount to the skills of an emergency physician [2]. The specialty has traditionally emphasized the importance of quickly distinguishing patients who are "sick" from those who are "not-sick," as well as efficiently and safely determining patient disposition. These abilities are not explicitly taught in medical education, as classically the aim has focused on disease-specific pattern recognition [2] more than medical decision-making [4]. In *The Biology of Emergency Medicine*, Dr. Peter Rosen notes, "We are poorly taught in medical school and residencies to distinguish 'sick' from well. There are two great shocks for every emergency medicine resident: one, not every patient is 'sick,' and two, many patients are much sicker than they first appear. Not only must we learn the specialized skill of sorting and treating these categories, but we must research the quality and quantity of care appropriate to each". [2]. ED patient presentations frequently represent an atypical and incomplete pattern of disease, requiring quick and efficient clinical information gathering, processing and illness recognition.

Traditionally, the diagnostic process has been considered a dichotomous operation involving intuition and analysis. [5] Recent advances in cognitive psychology, however, support a more integrated model referred to as the dual process theory. The dual process theory portrays an interaction between the intuitive and hypothetico-deductive systems within the same framework and flow of information and proposes that the interaction is modulated by two different subsystems, Systems 1 and 2 [6]. The first system, System 1, is rapid, automatic, almost completely unconscious, and requires minimal cognitive effort (your "gut feeling"). System 2, on the other hand, is time and resource intensive, deliberate, requires significant cognitive effort and is associated with hypothesis creation and testing [7]. In an

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evolutionary sense, System 1 tells us that the lion presents an immediate danger from which to instinctually escape from, whereas System 2 provides the analytical skills to reaffirm or refute System 1 insights, when, for example, that lion is actually a statue or a person with a lion costume on [8].

Although culturally we tend to think of System 2 as being of superior quality for solving complex problems [8], it has recently been postulated that there may be an under-appreciated high performance of System 1 reasoning, which can take advantage of scenarios ruled by bounded-rationality where economy of thought and efficiency are desirable [9].

In this study, we hypothesized that emergency physicians are able to predict patient disposition and acuity (sick vs not-sick) based on limited information, utilizing a System 1 approach. We also postulated that with increasing experience and training, emergency physicians' predictive performance improves.

2. Methods

2.1. Selection of participants and study setting

Study participants were emergency physicians with different levels of experience, including residents in training (Emergency Medicine [EM] post-graduate [PGY] 1, EM PGY2, and EM PGY3) and board-certified attending emergency physicians (EPs). The study was conducted in an academic ED with an annual census of 73 000 patient visits that is certified as a level-one trauma center. The study was deemed exempt by the institutional review board.

A protocol was written before the start of the study. Two observers (JW and KT) were trained over the period of one week by making observations on ED patient encounters, and inter-rater reliability was assessed. Disagreements were resolved by a third investigator (DC). After this run-in period, the data abstraction form was revised, and the study was subsequently conducted.

2.2. Study design

This was a prospective observational study of a convenience sample of physicians enrolled during different times of the day and evening, Monday through Sunday. The study was conducted over a period of one month. Patients were roomed in curtained areas, and physicians were permitted to briefly (usually less than 1 minute, although no time limit was enforced) observe the patient from outside the room without interviewing them before giving their responses to the study surveyor. We did not include patients younger than 18 years of age, those transferred from another institution with a referral diagnosis, presentation for a psychiatric complaint, known pregnancy, prisoners, patients in extremis (ie, requiring emergent, life-saving interventions), or Emergency Severity Index (ESI) level 1 and 2 trauma activations. The acuity level of the patients was ESI level 1, 2, and 3 in a high-acuity area and ESI level 3 and 4 in a medium-acuity area.

Physicians were given a flow sheet containing patient demographics (age and gender), chief complaint, method of arrival, and vital signs including blood pressure, temperature, oxygen saturation, heart rate, and respiratory rate. This sheet has routinely been created at triage (irrespective of this particular study) and was available at the door for the physician to see and for the nurse later to take notes. In addition, the patient's medications were included on a separate sheet based on historical data (later verified by nursing or pharmacy) Although there was no documentation at the bedside of past medical history, some degree of inference could be made by looking at the medication list or by rapidly checking the electronic medical record (EMR). Overall, no changes were made for this particular study with regard to the information that physicians routinely had available prior to evaluating each new patient.

In an attempt to minimize interruptions to each physician's natural workflow, we decided to allow physicians to view the past medical history (PMH) if that was part of the normal routine. In each of these cases, a notation was made on the standardized observer sheet. Furthermore, physicians were able to observe tracings from the cardiac monitor for patients roomed in the high acuity area of the ED. In the lower acuity area, this capability was not commonly available.

2.3. Study variables and data collection

The trained observers asked participating physicians to make two assessments: likely disposition, and sick vs not-sick, without giving an a priori definition of sick. Physicians were not given a strict definition of what would be classified as sick. Instead, they were instructed to use their own judgment, as they normally would when evaluating patients clinically. Answers to these questions were recorded on a standardized data collection form in real time. The physicians surveyed were part of the team providing care for the patient.

The trained observers queried physicians immediately before the first encounter with each particular patient but after physicians were allowed to see the initial patient information and briefly observe the patient. This decision was made to limit the effect of therapeutic intervention on their disease processes to isolate the observations to System 1 decision making. There was no set time limit for observation; however, most physicians deliberated no more than a few seconds before giving their answers.

2.4. Outcome measures

Within 1 week of the index ED presentation, the clinical records of enrolled patients were assessed to evaluate outcome. Disposition was classified as discharged home vs admitted. Hospital admissions were classified as intensive care unit (ICU) vs non-ICU.

As there is no standard consensus for the definition of sick in the literature, we elected to use an operational definition of sick based on disease processes and patient characteristics that are considered potentially life or limb threatening and commonly used in operations [10], finances [11], and education [12]. The definition of sick used in the study is detailed on Table 1. Two investigators (JW, KT), blinded to physician observations, classified cases as sick or not sick based on consensus. Discordances were resolved by a third investigator (DC).

2.5. Data analysis

Data were tabulated in a Microsoft Excel spreadsheet, and statistical analyses were conducted in JMP software version 8.0 (SAS Institute, Chicago, IL). For normally distributed variables, mean and SD were calculated and parametric tests were used; for skewed data, median and interquartile ranges were reported, and nonparametric tests were applied. Two-by-two contingency tables were constructed to calculate diagnostic performance estimates. We assessed sensitivity, specificity, likelihood ratios (LR; the probability of a given outcome among population with the condition divided by the probability of that outcome among population without the condition), and positive and negative predictive values and obtained 95% confidence intervals (CIs) using Meta-DiSc software [13].

3. Results

We obtained 284 provider observations from 189 patients, as more than one provider could observe each patient independently. One patient (1 provider observation) was excluded because the presentation was for a psychiatric complaint, and 10 patients (17 provider observations) did not give authorization for medical record review for research purposes and were also excluded.

Table 1
Definition of *sick*

A patient was considered sick if he/she fulfilled at least one of the following criteria:
Disposition
○Directly to operating room (OR)
○ Intensive Care Unit admission
○Telemetry floor admission (monitored bed)
○Death
Cardiac
○An admitting diagnosis of acute coronary syndrome (ACS) accompanied by an abnormal troponin or percutaneous coronary intervention/coronary artery bypass surgery during the index hospitalization
○Symptomatic arrhythmia
○Acutely decompensated congestive heart failure (CHF)
○Symptomatic pericardial effusion/tamponade
○Hypertensive emergency
Dermatological/immune
○Stevens Johnson syndrome (SJS)
○Toxic epidermal necrolysis (TEN)
○Staphylococcal scalded skin syndrome
○Anaphylaxis
○Angioedema
Toxicology
○Overdose with end-organ damage or abnormal vital signs
○Agitated delirium
○Medication side effect with end-organ damage or abnormal vital signs
○Toxic exposure with end-organ damage or abnormal vital signs
○Carbon monoxide poisoning
○Methemoglobinemia
○Cyanide poisoning
Electrolyte/renal
○Hypo/hyperkalemia requiring treatment
○Hypo/hypernatremia requiring treatment
○Hypo/hypercalcemia requiring treatment
○Rhabdomyolysis
○Necessity of emergent dialysis
Endocrine
○Thyroid storm/myxedema coma
○Adrenal failure
○Diabetic ketoacidosis (DKA)
Environmental
○Hypo/hyperthermia
○Electrocution
○Envenomation
Gastrointestinal
○Gastrointestinal bleeding (upper/lower) if intravenous fluids or blood products were administered or ICU admission was required
○Cholangitis
○Pancreatitis
○Liver failure/hepatitis
Hematologic
○Bleeding and coagulopathy requiring transfusion and/or anticoagulant reversal
○Thrombotic thrombocytopenic purpura (TTP) or disseminated intravascular coagulation (DIC)
Infectious
○Sepsis
○Meningitis
○Encephalitis
○Necrotizing fasciitis
○Toxic shock syndrome
○Rabies
○Neutropenic fever
Oncologic
○Newly diagnosed leukemia/lymphoma
○Tumor lysis syndrome
Neurological
○Intracranial hemorrhage
○Stroke
○Guillain-Barre syndrome
○Spinal cord compression syndromes
○Acute paralysis
○Myasthenia crisis
○Status epilepticus
Orthopedic/trauma
○Unstable cervical, thoracic, or lumbar fracture
○Fracture with neurovascular compromise
○Grade III open fracture
○Septic arthritis
○Flexor tenosynovitis
○Compartment syndrome
Procedure requirements
○Intubation
○Central line placement
○Chest tube
○Pericardiocentesis
Pulmonary
○Respiratory failure
○Refractory asthma exacerbation
○Pulmonary embolism
○Massive hemoptysis
○Pneumothorax/hemothorax
Surgical
○Bowel perforation
○Uncontrolled hemorrhage requiring operation/embolization
○Esophageal perforation
○American College of Surgeons Level 3 trauma injury requiring urgent/immediate operation or ICU admission
○Appendicitis
○Complicated diverticulitis
○Intra-abdominal abscess
○Volvulus
○Symptomatic/ruptured abdominal aortic aneurysm (AAA)
○Mesenteric ischemia

We analyzed a total of 266 observations of 178 different patients. Mean age (SD) of the subjects observed was 58.2 (19.3) years, and 120 (45%) were male patients. The majority of the observations (n = 178, 67%) were performed in the high-acuity area of the ED. Assessments were performed by attending physicians in 97 (37%) and residents in 169 (63%) (PGY1 = 9%, PGY2 = 27%, PGY3 = 27%, and 1 without record of the year of training [0.4%]).

Investigators classified 46 (26%) patients as sick and 132 (74%) patients as not sick. There were 12 disagreements that required resolution by a third investigator. Of the 178 patients, 84 (47%) were discharged home and 94 (53%) were admitted to the hospital. Of the 94 patients admitted to the hospital, 16 (17%) were admitted to an ICU.

Physicians predicted disposition (discharge vs hospital admission) correctly in 77% of the observations. Table 2 displays the performance with which physicians predicted patient disposition overall and by level of training. Attending physicians tended to be more sensitive (92.3% [95% CI 81.8-97.0] vs 85.1% [95% CI 76.5-90.9]) and specific (73.3% [95% CI 59.0-84.0] vs 60.0% [95% CI 48.7-70.3]) than resident physicians in predicting patient disposition, although these results were not statistically significant.

Table 3 displays the predictive performance among admitted patients. Attending physicians were more sensitive than resident physicians in predicting ICU vs non-ICU admission, and specificity was similarly high in both groups.

Physicians classified patient acuity correctly in 82.0% of the observations. Table 4 displays the performance with which physicians predicted patient acuity (sick vs not-sick) overall and by level of training. Attending physicians tended to be more sensitive than residents in predicting patient acuity (73.1% [95% CI 53.9-86.3] vs 62.7% [95% CI 49.0-74.7]), although this was also not statistically significant. Resident physicians had greater specificity, (91.5% [95% CI

Table 2
Diagnostic performance of physician prediction of disposition (discharge home vs hospital admission) (n = 266)

	All Physicians (95% CI)	Attendings (95% CI)	Residents (95% CI)
Sensitivity	87.7% (81.4-92.1)	92.3% (81.8-97.0)	85.1% (76.5-90.9)
Specificity	65.0% (56.1-72.9)	73.3% (59.0-84.0)	60.0% (48.7-70.3)
LR (+)	2.51 (95% CI 1.95-3.22)	3.46 (2.12-5.66)	2.13 (1.59-2.84)
LR (−)	0.19 (95% CI 0.12-0.30)	0.11 (0.04-0.27)	0.25 (0.15-0.42)

Table 3
Diagnostic performance of physician prediction of disposition (Non-intensive care unit [ICU] vs ICU) (n = 128)

	All Physicians (95% CI)	Attendings (95% CI)	Residents (95% CI)
Sensitivity	60.0% (42.3-75.4)	77.8% (45.3-93.7)	52.4% (32.4-71.7)
Specificity	95.9% (90.0-98.4)	94.9% (83.1-98.6)	96.6% (88.5-99.1)
LR (+)	14.7 (5.39-40.1)	15.2 (3.76-61.16)	15.5 (3.73-64.1)
LR (−)	0.42 (0.27-0.65)	0.23 (0.07-0.80)	0.49 (0.31-0.77)

85.1, 95.3] vs 83.1% [95% CI 72.7, 90.1]), though this also was not statistically significant.

There were 26 patients determined as sick by the criteria whom were incorrectly assessed as not-sick by the physicians during the initial encounter (Table 5). Of these patients; 4 (16%) patients had chest pain and positive cardiac markers, 4 (16%) suffered an acute heart failure syndrome and 12 (46%) presented with atrial fibrillation with rapid ventricular response.

When analyzing vital signs we observed that patients classified by *physicians* as sick had higher heart rates (HRs) (mean HR 94.2 vs 85.5 bpm, parametric test $P = .004$). Patients classified by *investigators* as sick also had higher HRs (mean HR 97.6 vs 83.9 bpm, parametric test $P < .0001$). Patients with higher respiratory rates were more likely to be classified as sick, with the same median in the predicted and definition groups (respiratory rate of 18 vs 17, non-parametric test $P < .05$ in both groups). Blood pressure and temperature were not associated with being predicted as sick.

When comparing the sensitivity and specificity of those that read the past medical history (16% of observations) vs those that did not read the history (84% of observations) at the time of patient evaluation, there was a non-significant trend toward higher sensitivity and lower specificity for those that read the past medical history before predicting sick (sensitivity 73% vs 64.5%, and specificity 77.8% vs 90.5% for the "read the past medical history" and "did not read the past medical history groups," respectively).

Of the 120 patients that were dismissed home, 9 returned to the ED within 72 hours, resulting in an ED return rate of 8%. Four patients were transferred to a higher level of care after hospital admission, including 3 of the 32 patients (9%) placed in the observation unit and 1 (1%) of the 74 patients admitted to the floor.

4. Discussion

4.1. Summary of major findings

In this study we observed that emergency physicians are able to accurately determine disposition based on minimal information using system 1 diagnostic reasoning. However, clinicians' accuracy identifying patients as sick was limited. Nearly half of the cases that physicians assessed incorrectly on initial assessment were atrial fibrillation with rapid ventricular response. As atrial fibrillation with rapid ventricular response has the potential to degenerate to tachycardia-mediated cardiomyopathy and is associated with stroke and increased morbidity and mortality in the long-term, it is critical to appreciate the potential seriousness of the diagnosis, despite how well patients may appear at initial assessment [14]. There were 4 cases of chest pain associated with positive cardiac markers and 4 cases of decompensated congestive heart failure that were also missed on initial assessment, highlighting the potential for atypical presentations of these diagnoses as well as the possibility for anchoring bias [11].

Table 4
Diagnostic performance of physician prediction of patient acuity (sick vs not sick) (n = 266)

	All Physicians (95% CI)	Attendings (95% CI)	Residents (95% CI)
Sensitivity	66.2% (55.1-75.8)	73.1% (53.9-86.3)	62.7% (49.0-74.7)
Specificity	88.4% (83.0-92.2)	83.1% (72.7-90.1)	91.5% (85.1-95.3)
PPV	69.9% (58.6-79.2)	61.3% (43.8-76.3)	76.2% (61.5-86.5)
NPV	86.5% (81.0-90.6)	89.4% (79.7-94.8)	85.0% (77.8-90.2)
LR (+)	5.69 (3.72-8.69)	4.32 (2.46-7.62)	7.40 (3.95-13.90)
LR (−)	0.38 (0.28-0.53)	0.32 (0.17-0.62)	0.41 (0.28-0.58)

Table 5
Sick patients incorrectly assessed as not-sick by physician (n = 26)

Missed sick diagnosis	Resident	Attending
Atrial fibrillation with rapid ventricular response	8	4
Acute decompensated heart failure	2	2
NSTEMI	2	0
Mild adrenal crisis	1	0
ICU admission	1	0
GI bleed requiring transfusion	2	0
Pancreatitis	1	0
ACS with abnormal cardiac catheterization	2	1

Although we observed no statistically significant difference in sensitivity or specificity based on level of training, the point estimates suggest that attendings predict patient disposition with greater sensitivity and specificity compared to residents and predict acuity with greater sensitivity and lower specificity compared to residents. This likely indicates that, with experience, emergency physicians become more adept at safely determining patient's disposition and acuity. A possible explanation for this trend for higher specificity of the residents could be that these patients have a more typical pattern of disease presentation. In a busy, high acuity ED, this degree of sensitivity could potentially allow for earlier and safer resource allocation and triage to the most appropriate patient care area within a health system. The lack of statistically significant differences could be secondary to an underpowered sample size; as there were no previous data regarding the performance of these groups, the calculation of the sample size was challenging.

With regard to the analysis of vital signs, we found that elevated heart rate and respiratory rate were predictors of being predicted and classified as sick, which re-affirms the importance of these clues as an initial marker of occult illness.

4.2. Strengths and limitations

There are a number of potential limitations in this study. Although the concept of sick is widely used in the medical and emergency medicine communities, there is no commonly accepted definition. To maximize the reproducibility of our findings, we systematically applied a definition of sick based on financial [10], operational [11], and educational rationale [12] to classify outcomes. We also blinded outcome assessors to physicians' observations to limit the introduction of bias in outcome classification. Another limitation is that a number of immediate biases are present even before starting the initial patient evaluation [15]. In particular, both the documented chief complaint and the ESI triage criteria may cause potential anchoring, even though the triage decision may be made in error or be influenced by a variety of other extraneous variables in ED flow and operations.

Finally, by virtue of being asked to complete the assessment before pursuing a detailed evaluation, there is the possibility that study participants were subject to premature closure or even developed anchoring to their own incomplete assessment (eg, still believing a patient is sick despite the evidence showing something different because System 2 is unable to override System 1, or when assessing disposition, attendings were the ones making the ultimate disposition decision [5,8].

One of the strengths of this study is the analysis of the issue of decision-making in a naturalistic fashion; observing physicians' decision-making in real scenarios, where natural constraints exist and where physicians have a real relation/duty with the patients. Following this premise, we evaluated System 1 decision-making using a set of data that is almost always universally available at the beginning of any patient-doctor encounter.

4.3. Clinical implications and future directions

One of the most fundamental elements of emergency medicine is timely and accurate decision-making and the initiation of life, limb, or eyesight saving interventions. Ideally, physicians would have an infinite amount of time to consider all possible scenarios. However, clinical practice often allows only a few critical seconds or minutes for decision-making. Future work is needed to assess the implications of System 1 and 2 cognitive processes on medical school and residency training, to measure the impact of different types of medical training (eg, classroom/book learning vs simulation) on developing these clinical decision-making skills, and to assess physicians' decision-making skills in practice as a component of clinical competency.

5. Conclusion

EPs are able to accurately predict the disposition of ED patients using System 1 diagnostic reasoning based on minimal available information. However, the prognostic accuracy of acuity prediction was limited. With experience, emergency physicians likely become more adept at safely determining patient disposition and acuity.

References

[1] Kassirer JP, Wong JB, Kopelman RI. Learning clinical reasoning. 2nd ed. Lippincott, Williams & Wilkins; 2009. p. 3–7 Chapter 1, Overview.
[2] Rosen P. The biology of emergency medicine. JACEP 1979;8(7):280–3.
[3] EM Model Review Task Force, Perina DG, Brunett CP, Caro DA, Char DM, Chisholm CD, et al. The 2011 model of the clinical practice of emergency medicine. Acad Emerg Med 2012(7).
[4] Croskerry P. The cognitive imperative: thinking about how we think. Acad Emerg Med 2000(11):1223–31 [Review. PubMed PMID: 11073470].
[5] Croskerry P. A universal model of diagnostic reasoning. Acad Med 2009;84(8):1022–8.
[6] Sloman S. The empirical case for two systems of reasoning. Psychol Bull 1996;119:3–22.
[7] Evans JS. Dual-processing accounts of reasoning, judgment, and social cognition. Annu Rev Psychol 2008;59:255–78.
[8] Kahneman D. Thinking fast and slow. 1st ed. Farrar, Straus and Giroux. 2011. Part I. Two systems; p 19–108.
[9] March J.G. Primer on decision making: how decisions happen. p. 8–22. Free Press. 2009. Chapter 1: Limited rationality. 1–56.
[10] Tanabe P, Gimbel R, Yarnold PR, Kyriacou DN, Adams JG. Reliability and validity of scores on the Emergency Severity Index version 3. Acad Emerg Med 2004;11:59–65.
[11] CMS Manual System—Centers for Medicare & Medicaid Services [Internet]. Centers for Medicare & Medicaid Services (CMS). Department of Health & Human Services (DHHS). [published 2011 Aug 26; reviewed 2012 Nov 19; cited 2012 Nov 19]. http://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/downloads/R2282CP.pdf.
[12] New accreditation system. http://www.acgme-nas.org/assets/pdf/EM%20Milestones%20Meeting4_Final%2010%209%202012.pdf.
[13] Zamora J, Abraira V, Muriel A, Khan K, Coomarasamy A. Meta-DiSc: a software for meta-analysis of test accuracy data. BMC Med Res Methodol 2006;6:31.
[14] Medi C, Kalman JM, Haqqani H, Vohra JK, Morton JB, Sparks PB, et al. Tachycardia-mediated cardiomyopathy secondary to focal atrial tachycardia: long-term outcome after catheter ablation. J Am Coll Cardiol 2009;53(19):1791–7.
[15] Seasonal influenza (flu). Rapid diagnostic testing for influenza [Internet]. Centers for Disease Control and Prevention (US); [reviewed 2012 Nov 19; cited 2012 Nov 19]. http://www.cdc.gov/flu/professionals/diagnosis/rapidlab.htm.