A COLLABORATIVE RESEARCH-OPERATIONS PARTNERSHIP FOR IMPROVING SAFETY OF DIAGNOSIS

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Multidisciplinary Team

Using health information technology and sociotechnical approaches to understand and improve diagnosis

Dean
Medical Informatics
Ashley
Psychologist/Analyst
Arushi
Research Coordinator
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Physician/Health IT
Traber
Social Work/Qualitative Research

Viral
Vraj
Elise
Donna
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Li

Physician-Informatics
Physician/Health IT
Research Coordinator
Project Coordinator
Research Coordinator
Data Analyst
Poll Question #1:

My main role in the VA is ____________________

• Research Investigator/Research Staff
• Administrative/Operations
• IT/Informatics
• Clinician/Clinical Staff
• Other (specify)
“...the absence of effective mechanisms for meaningful and regular coordination between health services researchers and health systems leaders, clinicians, and other key stakeholders. Generally speaking, researchers publish studies hoping that the appropriate stakeholder group will somehow learn of their work and *also* implement their findings.”
Journey of Partnership

• From Evidence to Impact in collaboration with VA Partners:
  – Generate evidence to solve a problem (VA National Center for Patient Safety- NCPS)
  – Knowledge transfer (Primary Care Program Office & NCPS)
  – Partnership research (VA Network: VISN 12)
  – Impacting measurement initiatives (Office of Performance Measurement)
Journey of Partnership

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Most Americans who go to the doctor will get a diagnosis that is wrong or late at least once in their lives, sometimes with terrible consequences, according to a report released Tuesday by an independent panel of medical experts.

This critical type of health-care error is far more common than medication mistakes or surgery on the wrong patient or body part. But until now, diagnostic errors have been a relatively understudied and unmeasured area of patient safety. Much of patient safety is focused on errors in hospitals, not mistakes in diagnoses that take place in doctors’ offices, surgical centers and other outpatient facilities.

The new report by the Institute of Medicine, the health arm of the National Academy of Sciences, outlines a system-wide problem. The report's authors say they don't know how many diagnostic errors take place. But the report cited one estimate that such errors affect at least 12 million adults each year, or about 5 percent of adults who seek outpatient care.
Abnormal Test Results May Not Get to Patients

By NICHOLAS BAKALAR
Published: June 22, 2009

If you think your doctor will automatically tell you if you have an abnormal test result, think again. Researchers studying office procedures among primary care physicians found evidence that more than 7 percent of clinically significant findings were never reported to the patient.

The scientists, led by Dr. Lawrence P. Casalino, an associate professor at Weill Cornell Medical College, reviewed the records of 5,434 patients at 19 independent primary care practices and four based in academic medical centers. They extracted records that contained abnormal results for blood tests or X-rays and other imaging studies, and then searched for documentation that the patient had been properly informed of the problem in a timely way.

Then they surveyed the doctors with uninformed patients. Some told them that the patient had been informed, even though there was no documentation, while
Errors of Test Results Follow-up

- Failure to follow-up abnormal test results: up to 36%

- Review by Callen in JGIM: 6.8%-62% for laboratory tests and 1.0%-35.7% for radiology.

- Communication breakdowns prevalent but also a problem IT can solve!

- Will technology eliminate failures to follow-up test results?

Elder Family Medicine 2010
Callen et al JGIM 2012
Singh et al JGIM 2007
Case Study

Alert in “View Alert” window
“View Alert” window

Example of an abnormal imaging alert

<table>
<thead>
<tr>
<th>Info</th>
<th>Patient</th>
<th>Location</th>
<th>Urgency</th>
<th>Alert Date/Time</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZZTestpt 333</td>
<td>ZZTestpt 333</td>
<td>3C MED</td>
<td>HIGH</td>
<td>01/21/2009@00:21</td>
<td>Medications nearing expiration.</td>
</tr>
<tr>
<td>ZZTestpt 9999999999</td>
<td>ZZTestpt 9999999999</td>
<td>3B</td>
<td>Moderate</td>
<td>01/22/2009@11:37</td>
<td>Scheduled Consult: NON-INVASI ECHO</td>
</tr>
<tr>
<td>ZZTestpt 9999999999</td>
<td>ZZTestpt 9999999999</td>
<td>3B</td>
<td>Moderate</td>
<td>01/22/2009@13:06</td>
<td>Completed Consult NON-INVASI ECHO</td>
</tr>
<tr>
<td>ZZTestpt 8888888888</td>
<td>ZZTestpt 8888888888</td>
<td>3B</td>
<td>Moderate</td>
<td>01/18/2009@08:18</td>
<td>Abnormal labs - [COMPREHENSIVE METABOLIC]</td>
</tr>
<tr>
<td>ZZTestpt 7777777777</td>
<td>ZZTestpt 7777777777</td>
<td>2A REHAB</td>
<td>HIGH</td>
<td>01/16/2009@12:09</td>
<td>Imaging Results: CT THORAX W/CONT</td>
</tr>
<tr>
<td>ZZTestpt 7777777777</td>
<td>ZZTestpt 7777777777</td>
<td>2A REHAB</td>
<td>Moderate</td>
<td>01/16/2009@09:17</td>
<td>Imaging Results: CHEST SINGLE VIEW</td>
</tr>
<tr>
<td>ZZTestpt 44444</td>
<td>ZZTestpt 44444</td>
<td>2A REHAB</td>
<td>Moderate</td>
<td>01/21/2009@12:39</td>
<td>Completed Consult NON-INVASI EKG: BEDS</td>
</tr>
<tr>
<td>ZZTestpt 22</td>
<td>ZZTestpt 22</td>
<td>2A REHAB</td>
<td>Moderate</td>
<td>01/22/2009@12:43</td>
<td>Forwarded consult PHARMACY HOUSTON 01</td>
</tr>
<tr>
<td>ZZTestpt 22</td>
<td>ZZTestpt 22</td>
<td>2A REHAB</td>
<td>Moderate</td>
<td>01/14/2009@09:39</td>
<td>Completed Consult AUDIOLOGY</td>
</tr>
<tr>
<td>ZZTestpt 1</td>
<td>ZZTestpt 1</td>
<td>2A REHAB</td>
<td>Moderate</td>
<td>01/20/2009@13:47</td>
<td>Scheduled Consult: ORTHOPEDICS</td>
</tr>
</tbody>
</table>
Partner NCPS: Communication of Results

• Evaluation of 1,163 outpatient abnormal lab & 1,196 abnormal imaging test result alerts
  – 7% abnormal labs lacked timely follow-up
  – 8% abnormal imaging lacked timely follow-up

• Why abnormal test results continue to get missed in health IT-based settings

Singh et al Am J Med 2010
Singh et al Archives of Int Med 2009
Ambiguous Responsibility a Huge Issue
Too many electronic health record alerts may be leading doctors to skip them

Your doctor may be more likely to ignore your test results if they come electronically.

A new study published in the JAMA Internal Medicine on Mar. 4 revealed that doctors receive about 63 electronic health record (EHR)-based alerts each day, which are supposed to let them know about abnormal patient results. And, almost one-third of the doctors surveyed—about 30 percent—admitted that they had missed some results because of too many alerts.

"If you're getting 100 emails a day, you are bound to miss a few. I study this area and I still sometimes miss emails. We have good intentions, but sometimes getting too many can be a problem," Dr. Hardeep Singh, chief of health policy, quality, and informatics at the Michael E. DeBakey Veterans Affairs Medical Center, in Houston, told TIME.
Primary care practitioners’ views on test result management in EHR-enabled health systems: a national survey

Hardeep Singh, ¹ Christiane Spitzmueller,² Nancy J Petersen,¹ Mona K Sawhney,¹ Michael W Smith,¹ Daniel R Murphy,¹ Donna Espadas,¹ Archana Laxmisan,¹ Dean F Sittig³

Table 6 New features and functions to improve EHR-based notification

<table>
<thead>
<tr>
<th>Item</th>
<th>Agree or strongly agree n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware and software</strong></td>
<td></td>
</tr>
<tr>
<td>Improving communication and alert management options</td>
<td></td>
</tr>
<tr>
<td>I would like to be able to set reminders for myself for future actions</td>
<td>2160 (83.4)</td>
</tr>
<tr>
<td>I would like to have a messaging system within CPRS that would allow providers to communicate with one another - this would be outside the View Alert system</td>
<td>1826 (70.5)</td>
</tr>
<tr>
<td><strong>Human–computer interface</strong></td>
<td></td>
</tr>
<tr>
<td>Improving alert visualization</td>
<td></td>
</tr>
<tr>
<td>I would like to receive high priority test result notifications in one window, and all other alert notifications in another window</td>
<td>1611 (62.2)</td>
</tr>
<tr>
<td>I would like an option to display only certain alert notifications at a time (ie, filter to display only surrogate, inpatient, or high priority alerts)</td>
<td>1722 (66.5)</td>
</tr>
<tr>
<td>I would like to have my alert notifications color-coded according to type (eg, surrogate, inpatient, or high priority alerts)</td>
<td>1720 (66.4)</td>
</tr>
<tr>
<td><strong>Better processing and tracking of alerts</strong></td>
<td></td>
</tr>
<tr>
<td>I would like to be able to retrieve my deleted alert notifications</td>
<td>2036 (78.6)</td>
</tr>
<tr>
<td>High priority alert notifications should not disappear until I actively delete them after taking follow-up action</td>
<td>1913 (73.9)</td>
</tr>
</tbody>
</table>
## Multiple “Socio-Technical” Issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Software</strong></td>
<td>no functionality for saving, tracking, and retrieving alerts; alerts ‘disappear’</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>too many unnecessary alerts</td>
</tr>
<tr>
<td><strong>Usability</strong></td>
<td>poor signal to noise ratio on screen</td>
</tr>
<tr>
<td><strong>Workflow</strong></td>
<td>“surrogate feature” to forward alerts when providers out of office not used properly</td>
</tr>
<tr>
<td><strong>Providers</strong></td>
<td>lack of knowledge/training</td>
</tr>
<tr>
<td><strong>Organizational</strong></td>
<td>policies for follow-up ambiguous; informatics workforce</td>
</tr>
</tbody>
</table>

Singh et al *JAMA Int Med* 2013
8-dimensional Socio-Technical Approach
We Developed CPRS-Based IT Fixes But...

Developing Software to “Track and Catch” Missed Follow-up of Abnormal Test Results in a Complex Sociotechnical Environment

M. Smith1; D. Murphy1; A. Laxmisan1; D. Sittig2; B. Reis1; A. Esquivel3; H. Singh1

1Houston VA HSR&D Center of Excellence and The Center of Inquiry to Improve Outpatient Safety Through Effective Electronic Communication, Michael E. DeBakey Veterans Affairs Medical Center and the Section of Health Services Research, Department of Medicine, Baylor College of Medicine, Houston, Texas;
2 University of Texas School of Biomedical Informatics and the UT-Memorial Hermann Center for Healthcare Quality & Safety, Houston, Texas;
3 Department of Clinical Effectiveness and Performance Measurement, St. Luke’s Episcopal Health System, Houston, Texas
Ten Strategies to Improve Management of Abnormal Test Result Alerts in the Electronic Health Record

Hardeep Singh, MD, MPH, Lindsey Wilson, MA, Brian Reis, BE

National Patient Safety Goals
Eight Recommendations for Policies for Communicating Abnormal Test Results
Hardeep Singh, M.D., M.P.H.; Meena S. Vij, M.D.

Improving Test Result Follow-up through Electronic Health Records Requires More than Just an Alert
Dean F. Sittig, PhD and Hardeep Singh, MD, MPH

A recent American Medical Association report highlighted failures in communication of abnormal test results as an important but understudied facet of improving safety in ambulatory care. Because many outpatient test results are communicated electronically, it is important to examine how best to ensure that results are available to the appropriate team members within an appropriate time. This is particularly true in the current climate where many patients are asking to see their results quickly and for medical errors to be minimized. N Engl J Med 365:75-6, 2011

J Gen Intern Med 27(10):1235-7
DOI: 10.1007/s11606-012-2161-y
© Society of General Internal Medicine 2012

The Joint Commission Journal on Quality and Patient Safety
From “Academic” to “Field” Products

- Goal to impact practice and policy by working with a partner to convert evidence into action

- Worked with NCPS and Primary Care Program Office to develop and disseminate “field-ready” tools, strategies, and guidance

Ten Strategies for View Alerts Toolkit (VA Pulse)
Policy Impact: Communicating Test Results to Providers and Patients

- Invited by Primary Care leadership to lead a national workgroup to revise VHA Directive
- Several policy modifications based on this research included in revision
- VHA Directive 1088 released Oct 8 2015 is now in effect

VHA Directive 1088
Practice Impact: VHA Communication of Test Results (CTR) Toolkit

- VAMCs face challenges w/ policy requirements
  - Worked with a multidisciplinary national workgroup to develop the CTR toolkit to help VA facilities achieve standards of test result notification
  - National resource hosted on VACO sharepoint

CTR Sharepoint
Practice Impact: A Checklist to Improve CPRS View Alert Notifications

- Worked with key VA stakeholders to develop a Checklist to assist VHA facilities in addressing View Alerts
- Actionable, practical recommendations for both CPRS Users and VA Facility leadership
- Disseminated nationally & influenced 2 VISN Pilot Projects

Also available on VA Pulse
Impact Outside the VA

• The Office of the National Coordinator for Health Information Technology (ONC)-sponsored “Safety Assurance Factors for EHR Resilience (SAFER) project”

• Proactive risk assessment and guidance

• “1st draft” of best practices and knowledge

• Self-assessment; not meant to be regulatory
  – Focused on high-risk areas including test results communication
  – Nine guides—all freely available

http://www.healthit.gov/safer

Singh et al *BMC Med Inf* 2013
Recommended Practice

21  The EHR has the capability for the clinician to set reminders for future tasks to facilitate test result follow-up. 28,40

Rationale for Practice or Risk Assessment

The EHR can help clinicians follow-up with patients regarding test results. Unless they set reminders for themselves, clinicians may forget about follow-up tasks they need to do.

Examples of Potentially Useful Practices/Scenarios

- Functionality to record a follow-up action due at a future date exists in the EHR.

Suggested Sources of Input

EHR developer
Health IT support staff
The Clinical Laboratory Improvement Advisory Committee (CLIAC), managed by the Centers for Disease Control and Prevention (CDC), provides scientific and technical advice and guidance to the Department of Health and Human Services (HHS). The Committee includes diverse membership across laboratory specialties, professional roles, (laboratory management, technical, physicians, nurses) and practice settings (academic, clinical, public health), and includes a consumer representative.

**Recommendation 1a**

CMS should convene a multidisciplinary group* to

- Generate a report describing a process for health care institutions to improve safe communication and follow-up of diagnostic test results to providers and/or patients with clear guidelines on timelines for communicating those results
- Provide an implementation and evaluation plan for the process
Identification and Prioritization of Health IT Patient Safety Measures

FINAL REPORT
FEBRUARY 11, 2016

NATIONAL QUALITY FORUM

This report is funded by the Department of Health and Human Services under contract HHSM-500-2012-00009I, Task Order HHSM-500-T0016.

http://www.qualityforum.org/HIT_Safety.aspx
http://apps.who.int/iris/bitstream/10665/252410/1/9789241511636-eng.pdf
Journey of Partnership

• From Evidence to Impact in collaboration with VA Partners:
  – Generate evidence to solve a problem (VA National Center for Patient Safety)
  – Knowledge transfer (Primary Care Program Office)
  – Partnership research (VA Network: VISN 12)
  – Impacting measurement (EPRP)
Data $\rightarrow$ Information $\rightarrow$ Knowledge

- Missed/delayed cancer diagnosis a safety concern across many systems
- Major reason: Lack of timely follow-up of cancer-related abnormal test results
- Measurement is key

Singh et al JCO 2010
Singh et al Am J Gastro 2009
Safer Diagnosis (Safer Dx) Measurement Framework

Sociotechnical Work System*

Diagnostic Process Dimensions
- Patient-provider encounter & initial diagnostic assessment
- Diagnostic test performance & interpretation
- Follow-up and tracking of diagnostic information
- Subspecialty consultation/referral issues

Measurement of diagnostic errors
- Reliable
- Valid
- Retrospective
- Prospective

Changes in policy and practice to reduce preventable harm from missed, delayed, wrong or over diagnosis

Safer Diagnosis
- Collective mindfulness
- Organizational learning
- Improved calibration
- Better measurement tools and definitions

Feedback for improvement

Improved value of health care
Improved Patient Outcomes

* Includes 8 technological and non-technological dimensions

Singh & Sittig BMJQS 2015
EHRs Enable Measurement of Safety

- EHR-based notification is only a start
- On a daily basis, thousands of patients have abnormal test results
- Can we electronically identify those likely to be experiencing delays and intervene?
- Like finding “needles in the haystack” and “creating safety nets”

Murphy et al BMJQS 2013
Big Data Safety Net

- Electronic health record (EHR)-based triggers look for follow-up actions on clues (or red flags) to detect delays prospectively

- Basic versions:
  - + hemoccult or microcytic anemia with no subsequent colonoscopy in 60 days
  - suspicious chest-x ray with no follow-up CT scan in 30 days

Murphy et al Radiology 2015
Murphy et al BMJQS 2013
Development and Validation of Electronic Health Record–based Triggers to Detect Delays in Follow-up of Abnormal Lung Imaging Findings

Electronic health record-based triggers to detect potential delays in cancer diagnosis

Daniel R Murphy, Archana Laxmisan, Brian A Reis, Eric J Thomas, Adol Esquivel, Samuel N Forjuoh, Rohan Parikh, Myrna M Khan, Hardeep Singh

ABSTRACT
Background Delayed diagnosis of cancer can lead to worse outcomes. The purpose of this study is to develop and validate electronic health record (EHR)-based triggers to detect potential delays in follow-up of abnormal clinical findings suspicious for cancer.
How context affects electronic health record-based test result follow-up: a mixed-methods evaluation

Shailaja Menon, Michael W Smith, Dean F Sittig, Nancy J Petersen, Sylvia J Hysong, Donna Espadas, Varsha Modi, Hardeep Singh

ABSTRACT

Objectives: Electronic health record (EHR)-based alerts can facilitate transmission of test results to healthcare providers, helping ensure timely and appropriate follow-up. However, failure to follow-up on abnormal test results (missed test results) persists in EHR-enabled healthcare settings. We aimed to identify contextual factors associated with facility-level variation in missed test results within the Veterans Affairs (VA) health system.

Design, setting and participants: Based on a previous survey, we categorised VA facilities according to primary care providers’ (PCPs’) perceptions of low (n=20) versus high (n=20) risk of missed test results. We interviewed facility representatives to collect data on several contextual factors derived from a sociotechnical conceptual model of safe and effective EHR use. We compared these factors between facilities categorised as low and high perceived risk, adjusting for structural characteristics.

Results: Facilities with low perceived risk were significantly more likely to use specific strategies to prevent alerts from being lost to follow-up (p=0.0114). Qualitative analysis identified three high-risk scenarios for missed test results: alerts on tests ordered by trainees, alerts ‘handed off’ to another covering clinician (surrogate clinician), and alerts on patients not assigned in the EHR to a PCP. Test result follow-up failures can be traced to ambiguity among providers about responsibility for follow-up, perceived ‘information overload’ among providers who receive large volumes of alerts, and lack of timely follow-up of test results remains a major patient safety concern in most healthcare organisations.

Conclusions: Our study identified several scenarios that pose a higher risk for missed test results in EHR-based healthcare systems. In addition to implementing provider-level strategies to prevent missed test results, healthcare organisations should consider implementing monitoring systems to track missed test results.

Although EHRs appear to reduce the risk of missed test results,2 4 5 they do not eliminate the problem.2 3 6 Lack of timely follow-up of test results remains a major patient safety concern in most healthcare organisations.7–9

Previous work has shown that test result follow-up failures can be traced to ambiguity among providers about responsibility for follow-up,10–12 perceived ‘information overload’ among providers who receive large volumes of alerts, and lack of timely follow-up of test results remains a major patient safety concern in most healthcare organisations.

Strengths and limitations of this study

▪ Effectiveness of test results management in electronic health record (EHR)-enabled settings might be influenced by several sociotechnical factors, which have not been examined in detail before.

▪ This study uses a mixed-methods approach to examine the role of several sociotechnical factors involved in ‘missed’ abnormal test results.

▪ Several generalisable high-risk scenarios for missed test results emerged.

▪ Certain test management practices described in our study might only apply to Veterans Affairs facilities, potentially limiting their widespread generalisability.

National Solution for a National Problem

• Can We Leverage VA Informatics and Computing Infrastructure (VINCI)?

• Facilitates data analysis in a secure environment and serves as both a software development environment and place to store data

• Partners with the Corporate Data Warehouse (CDW) and hosts all data available through CDW
Partners Influencing A Proposed Intervention

“...CREATE and COIN are transformational; they support not only collaborative researchers but also the VHA managers, or stakeholders, likely to use the results of the research. Researchers and stakeholders work together throughout the course of a study—from the formulation of research questions to the analysis and interpretation of the results. When the research is complete, VHA managers will be poised to use the results to improve practice.”

Sara Knight, PhD, Deputy Director, VA HSR&D
HSR&D FORUM, August 2013


Slide courtesy of Petersen, LA
CREATE Project Background

• Develop and evaluate an automated surveillance intervention based on electronic triggers
  – But who to send lost-to-follow-up test results information to?
• Used a sociotechnical approach to determine what partner sites wanted
CREATE Partner: VA Network (VISN)12

• Met with VISN Leaders & participating facility representatives
  – Nursing Executive Council, Primary Care Advisory Committee, Health Systems Council, and Quality and Safety Council

• Determined optimal strategies to feed information to the point of care

• Leadership support obtained for designated mid-level provider for tracking at each participating facility
CREATE Cancer Tracking Intervention

**Trigger positive patients in 5 cancers**

*Includes patients who are lost to follow-up (true positive) and those who are not (false positive)*

Data view provided to VISN 12 operations personnel *(On VINCI servers)*

One Primary Care/PACT facility-level recipient *(RN/PA/NP)* acts upon VINCI reports and ensures communication and follow-up*

Reports delivered to: Feedback

Multiple final recipients at each facility
*
*Intervention will be remotely monitored by Houston-based researchers throughout the study period*
Journey of Partnership

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  – Impacting measurement initiatives (Office of Performance Measurement)
Impacting Measurement

• External Peer Review Program (EPRP): VA’s national quality measurement and review program

• Designed to provide all VA facilities with quality of care information obtained via random medical record reviews

• Tasked with creating a VA-wide measurement system for patient notification of test results
Quality Measurement Program

• Guided by VA policy and informed by the 2012 Communication of Test Results Toolkit
• Reviews evaluate randomly selected facility-level records for timeliness of patient notification of test results according to time periods in VA policy
• Worked with Primary Care Operations and Office of Performance Measurement staff to revise measures to accommodate new policy
Our Roles

• Determine how measurement should be aligned with new VA policy, including developing an algorithm that defined when the criteria for notification were met

• Influence record review process (i.e. improve accuracy and reproducibility)

• Serve as subject matter experts for implementation of measurement program
Our Contribution/Impact

- Streamline EPRP chart abstraction algorithms
- Strengthen reliability and validity of measurement through pilot testing and discussion
- Determine which high priority test results could serve as a basis for chart abstraction
- Try to minimize unintended consequences of measurement
Publishing Journal Papers Not Enough

• Quality & Safety research valuable for delivery system operations that needs solutions
• Research-Operations Partnership a key ingredient for research to lead to impact patient care & policy
• Opportunities for HSR to collaborate w/ operations:
  – generating evidence to solve quality/safety problems,
  – translate knowledge,
  – do research more aligned with the clinical front-lines,
  – impact existing measurement /evaluation programs
Thank you and Acknowledgements

- VA National Center for Patient Safety
- VA Primary Care Program Office
- VISN 12
- EPRP
- VA HSR&D
- AHRQ
- Multidisciplinary team at VA Health Services Research Center for Innovation
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