Improving Outpatient Medication Therapy Through:

Medication Reconciliation

Clinical Decision Support Systems

E-Prescribing

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Integration, Interoperability & Standards
Med-Inf. 405-DL
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Introduction

Because of the unstructured medication data capturing system that is in place within my agency, the capturing, transmitting, tracking, monitoring, and reporting on of patient medications, both inside and outside of the healthcare organization, is not conducive to providing the utmost quality of care to the behavioral health patients who are served throughout the organization. The critical issue for healthcare information exchange and interoperability is adoption of basic electronic communication standards that allow stakeholders to format, transmit, receive, and store data. (1) It is the goal of this project to look at the current systems related to the capturing of medication data and see where enhancements could be made in order to complete the medication reconciliation process that is necessary in an outpatient behavioral healthcare setting. Monitoring of medication allows for the ability to ascertain medications a patient is taking, both those prescribed by the agency physicians, as well as medications prescribed by outside providers. This would be accomplished through the use of interoperability of healthcare, pharmacy, and patient systems. These systems would be integrated and interfaced in order for them to provide for the enhancement of the medication reconciliation process which will, in turn, have a positive impact on the overall care of behavioral health patients. The other area which will be reviewed will be the decision making tools available to physicians during the prescribing process. We need to be sure that all the necessary information is available for the physician before and during the prescribing process in order to facilitate prescribing best practices for a behavioral health population.

Medication reconciliation is the process of reconciling – integrating – the various medications a patient is receiving from all health care providers. Patients often see a multitude of clinicians, with the medical records scattered across several offices and hospitals. (2) Important health information located in these records cannot be easily accessed or integrated thus it is difficult to have a clear understanding of the complete medical picture of the patient. Because of this fragmented healthcare and record keeping system, there is not a way to completely know, thus reconcile, the various medications a patient is prescribed and/or taking.
Quality Issue

Research across the United States shows that individuals diagnosed with a serious mental illness do not receive evidenced-based care. Past studies have documented quality issues including under- and overdosing of medications, inadequate duration of medication trials, frequent changes in medication regimen, medication-adherence issues, off label use of psychotropic medications in children, and the use of polypharmacy. (3)

Polypharmacy is the combining of two or more psychotropic medications to treat the same condition; two or more drugs in the same chemical class or with similar pharmacologic properties; concurrent use of four or more psychotropic medications of any type (3 in children), even when treating multiple conditions. (4) Physician prescribing practices with behavioral health patients is such that, at times, they are prescribed multiple medications from the same drug class. For example, they may receive several antipsychotic medications by the same prescriber or by more than one health care provider. Or, they could be prescribed a medication by the mental health provider that could pose potential drug/drug reaction if taken in concert with other medications being prescribed by other healthcare providers.

People with severe mental illnesses (SMI), such as schizophrenia, have a reduced life expectancy compared to the general population. They have a 2-3 fold increased risk of dying, and this mortality gap associated with mental illness compared to the general population has widened in recent decades. (5) Psychotropic polypharmacy is a major concern as there is the potential for this practice to cause Metabolic syndrome (MetS), obesity, diabetes, hypertension, cardiovascular disease, as well as increase in drug/drug interaction.

Table 1 Estimated prevalence and relative risk (RR) of modifiable cardiovascular disease risk factors in schizophrenia and bipolar disorder compared to the general population (6)

<table>
<thead>
<tr>
<th>Modifiable risk factors</th>
<th>Schizophrenia</th>
<th>Bipolar disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>45-55 (1.5-2)</td>
<td>21-49 (1-2)</td>
</tr>
<tr>
<td>Smoking</td>
<td>50-80 (2-3)</td>
<td>54-68 (2-3)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10-15 (2)</td>
<td>8-17 (1.5-2)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>19-58 (2-3)</td>
<td>35-61 (2-3)</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>25-69 (≤5)</td>
<td>23-38 (≤3)</td>
</tr>
<tr>
<td>Metabolic syndrome</td>
<td>37-63 (2-3)</td>
<td>30-49 (1.5-2)</td>
</tr>
</tbody>
</table>

Patients that have a particular diagnosis should not receive certain medications. These patients' medical conditions, as well as any medications they are being prescribed by their primary care physician, should be monitored closely. Because behavioral health patients may be receiving health services from more than one health care provider, mental health as well as primary care physician(s), as well as experiencing a number of inpatient psychiatric care admissions, over time it proves difficult to monitor medications the various medications that the patient is taking. This is due to additions, deletions, and titrations of medications.

Medication reconciliation, as described by The Joint Commission under National Patient Safety Goal (NPSG) 8 is “Accurately and completely reconciling medication across the continuum of care”. The rational for this NPSG is the belief that communication surrounding the current medication regimen of the patient, whenever new drugs are ordered, will reduce the risk of transition-related adverse drug events. When the patient is discharged from inpatient services, they are provided a list of their current medications. In the outpatient setting, it proves difficult to keep this list up-to-date – accurately and completely reconciling any discrepancies as new drugs are added. In addition to medications prescribed by a clinician, over the counter (OTCs) and herbal medications should also be part of this listing. Informed clinical decision-making and best practices require knowledge of past treatments and their results, but accurate and complete medication histories are very difficult to obtain. Consumers have long and complicated treatment histories and may lack specific information about past medications, are often seen by many different physicians in many different treatment settings. (7).

It should be noted that I work for a state mental healthcare organization in Northern New York. We have an agency-developed electronic medical record system (EMRS) that is not fully mandated by the State. We are understaffed in regard to board-certified psychiatrists. Because of this, we have many locum tenens that are hired to provide services to our patients. Locum tenens are physicians that are temporarily assigned to work at our facility. Their assignments last from several weeks, to several months. Many of these locum tenens work in the outpatient clinics. It should be noted that the outpatient clinic that has the largest number of patient identified as having polypharmacy and Metabolic Syndrome (MetS), receive services from the outpatient clinic that has experienced the most locum tenens transitions in the past few years. The few full-time psychiatrics that we have working for us do not support the use of the e-prescribing system that is available for use in our EMR. There is a concern in management that forcing the physicians to use e-prescribing will upset the physicians and thus may possibly prompt some to leave to find employment where e-prescribing is not the standard of practice. This is unfortunate
because the electronic prescribing, capturing, and transmission of medications would improve clinical care by enabling the capturing and reconciling of complete medication lists, thereby reducing duplicate drug therapy, drug interactions, and other adverse drug events, as well as medication abuse. In addition to e-prescribing, the interfacing of the inpatient medication manager with the outpatient EMR should occur. In addition to this, development of an electronic medication tracking tool for clinicians to use to record and review medications history will further enhance the reconciliation process. The data in this tool could preload from the inpatient and outpatient medication systems, and would be editable to add information from outside care providers, as well as OTC and herbal medications.

**Problem**

It has been the experience of mental health providers that gathering complete and accurate medication histories has proven difficult at best. There is concern that in sharing incomplete medication lists with patients and other healthcare providers, could cause more harm than good – which is against the mission of healthcare agencies – to provide quality healthcare services. This difficulty of medication reconciliation is due to the fact that the patient may be receiving services from numerous healthcare providers and at times, they may not always be the best historian when it comes to the number of medications they are taking. In recent case study reviews at my agency, I have noted that some patients are receiving at least four to five psychiatric medications. The average patient in my agency takes nine medications, this includes both psychotropic and other medications. (9)

**Suggested Improvement**

There should be interoperability throughout the medication process from the e-prescribing of medication (subsequent to an “on-line” review of the current and past medication history) with the prescription being electronically transmitted to the patient’s pharmacy. Once the patient picks up their prescription(s), the pharmacy will transmit an electronic message to the healthcare provider that the medication was picked up. There will need to be a system that certifies/validates the messaging so that the network server will know that the information is coming from a trusted source. In addition to this, the patient could document their response to the medication in a personal health record. Electronic monitoring of the response of medication could be completed by the clinician via a portal in the patient’s personal health care record. There is a high rate of no shows in our rural setting, so this review in
between clinic visits could assure the clinician that all is well with the patient, or that the patient is not responding well to the treatment and that they should be contacted to come in for an appointment. Of course this service would not be completed for every case, but for those high priority cases it would be an option.

**Current Systems:**

The agency has laboratory and pharmacy system used for inpatient services. The data in these two systems interfaces with the agency electronic medical record (EMR). There is also available a database that contains inside and outside provider and healthcare information related to Medicaid patients. Lastly, there is an enterprise-wide data warehouse which is relatively young and does not yet contain all key performance indicators.

**Current Process:**

When admitted to inpatient services, current medications are reviewed by admitting physicians and reconciliation process occurs as to which medications will be continued. Information is obtained from transferring hospital, patient, and/or personal guardian. Information is not electronically obtained from any current data systems, inside or outside of hospital. The medication orders are handwritten on a physician order sheet, which provides for the tracking of the orders, i.e., date the script was written, what medication was ordered, as well as the indication for use. Often times, the latter is missing from the documentation.

When patients are admitted to outpatient services, their current medications are reviewed by the nurse and documented in the EMR, in text format on a healthcare summary form. The healthcare organization in which I work has available for use an e-prescribing medication prescription writer (script writer) that would facilitate the writing of the *outpatient* prescription. With this system, the prescription is printed off and handed to the patient. The system does not have the capability to electronically submit the script to the pharmacy. Although the agency has the ability to electronically write the script for medications, as discussed earlier, my facility chooses not to use it. The script writer is housed within the organization’s electronic medical record (EMR). The EMR does NOT have a clinical decision support system, nor does it have a patient health record component. Inpatient laboratory and pharmacy systems interface with the EMR. The only system interface that occurs, outside of the organization, is with data related to medications, diagnoses, and outside services such as emergency room, inpatient admissions,
ambulatory visits, and laboratory tests for Medicaid patients. This information is gathered in a clinical knowledge enhancement system, known as PSYCKES Medicaid – Psychiatric Clinical Knowledge Enhancement System. It is being utilized to study the problem of polypharmacy and Metabolic Syndrome (MetS) in New York State mental health outpatients. The data contained within PSYCKES is generally three-four months old. Although the data is not real-time, the facility would benefit from the interface of this data in completion of the medication reconciliation tool. The views of the data within this database would enable clinicians to be able to review the medication from this system with the patient to ascertain what the patient is currently taking. Sometimes the patient knows they are on “something” for “something”. This data could assist in defining what exactly that would be. This database also contains patient diagnoses from outside healthcare providers, information which is important for the treating psychiatrist to know when making the decision as to which psychiatric medications to provide to the patient.

Because of the current systems, and lack of full implementation, gathering of information related to medications provided to behavioral health patients is difficult to complete – let alone the ability to provide an accurate accounting of this information. I propose three solutions to enhance this process. The first recommendation for solution to the need to reconcile patient medications across the continuum of care is to do what we are currently doing which is to gather the information from the patient, and if need be use systems, such as fax machine, telephone, and mail communications to gather, record and transmit information related to medications. The prescription is handwritten and provided to the patient. The problem with this system is that, although the documentation is entered into the EMR, because it is typed text, it is not codified, thus rendering it useless for data mining for future use in evaluation of patient care. With this system, the nurse will gather information from the patient related to their current list of medications from outside providers OTCs and herbal supplements. They will also review the most recent in-house medications as well. The patient will be encouraged to bring any pill bottles they have with them to assist in the data capturing process. The physician will use the information gathered by the nurse related to current medications in the prescription writing process. Once the prescription is written, if there are any questions from the pharmacy related to the patient’s script (legibility, missing information), a copy of an order can be faxed to the pharmacist and subsequent telephone calls can be made to the physician or nurse at the clinic. If during the medication reconciliation process the patient is not aware of all the medications they are currently prescribed, the nurse will contact either the pharmacy or local providers to obtain a complete listing. This information will then be faxed to the outpatient clinics, and at a later time, entered into the medical record. This process is time consuming and inefficient. It is not completed at the
time of the healthcare encounter thus making an accurate accounting of medication impossible. It is important that the patient have their own list of current medications, information obtained via various outside sources could be combined with a list of medications that the outpatient clinic prescribed and provided to the patient. This recommendation for reconciliation process is being made due the refusal of outpatient physicians to use the e-prescribing functionality. Also, previously attempts regarding the need to make quality improvements to our medication reconciliation processes, were met with much resistance, concern, and frustration. There was not the full support of all stakeholders involved; the most important stakeholders being the chief of outpatient services, as well as the clinical director who oversees the physicians. Although they understood the importance of medication reconciliation, they were not able to clearly define the need and solution, and they eventually made minimal adjustments to the process by instituting a paper form process.

Second Solution:

The second solution would be to use the current systems to the full extent possible, with minimal additional system implementation and improvements. The prescription would be written in our current EMR via the e-prescribing component available for use. The entering of the medication order produces both a paper prescription for the patient to take with them to present to the pharmacy and a chart copy as well. This system of keying in the information would at least make the information regarding in house prescriptions available electronically, therefore there would be the ability to collect the data electronically, facilitating the medication reconciliation process. Also, because the prescription is text, it provides for legibility, thus reducing any uncertainty once the patient presents the script to the pharmacy. The use of e-prescribing would assure all key elements of the prescription were present, such as strength, dose, and indication for use. Although the electronic recording of patient medications will enhance the process of capturing and reporting, it does not solve the full problem with the medication reconciliation process; which is to have a complete and accurate listing of patient medications. The agency should incorporate the use of a medication reconciliation monitoring tool which will facilitate the capturing and storing of medications from all care providers. See Table 1 for required data elements that would be useful in this process. This electronic data entry tool would allow for the ability to capture the required information necessary in a medication reconciliation process.
<table>
<thead>
<tr>
<th>Send to History</th>
<th>Medication</th>
<th>Dose</th>
<th>Route</th>
<th>Freq</th>
<th>Reason</th>
<th>Source</th>
<th>Reported by</th>
<th>Date Entered In Record</th>
<th>Date Pharmacy Pick Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trazadone</td>
<td></td>
<td>Oral</td>
<td>At bedtime</td>
<td>Depression</td>
<td>Agency prescribed</td>
<td>Script Writer</td>
<td>9/9/08</td>
<td>9/10/08</td>
</tr>
<tr>
<td></td>
<td>St. John’s Wart</td>
<td></td>
<td>Oral</td>
<td></td>
<td>Depression</td>
<td>Herbal Supplement</td>
<td>Patient</td>
<td>9/9/08</td>
<td>9/9/08</td>
</tr>
<tr>
<td></td>
<td>Tylenol</td>
<td>40 mg</td>
<td>Oral</td>
<td>Once a day</td>
<td>Headaches</td>
<td>OTC Outside Provider</td>
<td>Patient</td>
<td>9/9/08</td>
<td>9/9/08</td>
</tr>
<tr>
<td></td>
<td>Furosemide</td>
<td></td>
<td>Oral</td>
<td></td>
<td>Edema</td>
<td>Agency prescribed</td>
<td>Pharmacy</td>
<td>9/9/08</td>
<td>9/9/08</td>
</tr>
<tr>
<td></td>
<td>Risperdol Consta</td>
<td></td>
<td>Injection</td>
<td></td>
<td>Depression</td>
<td>Unknown</td>
<td>Patient</td>
<td>1/1/07</td>
<td>9/10/08</td>
</tr>
<tr>
<td></td>
<td>Patient reported in past possibly took Haldol with a poor reaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/1/07</td>
<td>9/10/08</td>
<td></td>
</tr>
</tbody>
</table>

The script writer does not contain a Clinical Decision Support System (CDSS). A CDSS would provide clinicians with real-time information related to a wide-range of diagnostic and treatment information that could be crucial during prescriptions writing process. Information that is related to current medications, diagnoses, and metabolic health indicators, such as BMI, blood pressure, and smoking status should be available and reviewed during the prescription writing process. CDS can check for a variety of potential errors such as drug interactions, patient allergies to medications, medication contraindications, as well as the ability to review currently prescribed medications which would prevent duplication of medication orders. The CDSS would alert the physician when he/she is prescribing more than one medication from the same drug class. This has been noted as a problem with behavioral health patients, which as noted earlier, have resulted in health complications for the patient.

**Third Solution:**

My third, and final solution to the difficulty in reconciling medications across the continuum of care, is to use the inpatient and outpatient systems available to the fullest extent, and also to integrate the hospital systems with pharmacy systems, as well as a patient health record. When the patient is discharged from inpatient to outpatient, medication information related to the inpatient admissions will be interfaced with the outpatient EMR. This will be done via a point-to-point interface. This is currently being completed, but once the patient is discharged, the data is no longer available for review and use. This interface across the continuum of care would allow outpatient staff to have access, electronically, to
medication information. When the patient presents to outpatient, the clinician will have available to them the last medication orders provided to the patient from inpatient services, as well as a history of what was ordered during inpatient hospitalization. The discharge medications will be available in the medication reconciliation tool (MRT). With this, the clinician will be able to review the medications, and determine, based on the patient’s response to treatment, how the medication therapy should proceed. Any further medication ordering for the patient will be completed electronically using e-prescribing component of the EMR.

Clinical decision support will provide the clinician with the clinical knowledge contained in the medication reconciliation tool. This will provide for improvement in the quality, safety, and efficiency of care when applied to the e-prescribing process. Due to polypharmacy indications and prescribing of particular types of psychotropic medications and implications related to MetS, the physician will not only be provided with an alert of potential polypharmacy, but, if they choose to continue to prescribe medications that would place the patient into a polypharmacy category, they will be required to note for the following reasons:

- History of minimum 3 or more failed trials of monotherapy
- Recommended plan to taper to monotherapy or tapering in process (cross-taper)
- Augmentation of Clozapine
- Symptom reduction
- Other augmentation
- Admitted on multiple antipsychotic medications

Another alert to the physician will be related to the patient’s diagnoses. If the patient has one of the following diagnoses assigned, there will also be an alert depending upon type of medication prescribed:

Diagnoses:

- Hypertension
- Any Ischemic Vascular Disease
- Hyperlipidemia
- Diabetes
- Obesity

The following medications should be highly scrutinized when being prescribed as they indicate an increase risk of MetS.

High Risk:
- Clozaril
- Zyprexa
**Moderate Risk:**

- Seroquel
- Thorazine
- Mellaril

For children, the following medications are the only acknowledged medications that do not pose a moderate or high risk for cardiometabolic disturbance:

- Abilify
- Moban
- Geodon

In order to incorporate a CDSS in the prescribing process, standards and vocabularies will need to be adopted to make the development and implementation of this system effective. SNOMED and LOINC are two standards identified to be used when developing a CDSS. Employment of information model (HL7 RIM) and vocabulary (SNOMED CT, LOINC) standards is a necessary and feasible requirement to achieve interoperability in clinical decision support. (10)

The EMR currently captures data related to BMI, smoking status, and blood pressure. This data will also be reviewed in conjunction with the prescribing of medication. If there are high values noted for instance with a BMI level an alert will pop up letting the physician know this. If the patient is indicated positive for smoking, an alert will show. The alerts would be based on medication being prescribed, being one that is of moderate or high risk, in conjunction with a current diagnoses related to MetS. These will not be separate alerts, but rather, a notification as such:

*Patient's BMI is 42, has positive smoking status, and carries a diagnoses of Hyperlipidemia*. The physician would be required to acknowledge the above statement noting they are aware of the health indicators. Note, as previously discussed, if physician is prescribing a medication that will place a patient in a polypharmacy category, he/she will be responsible for indicating the justification.

Once the e-script is written, it will be sent to the pharmacy of the patient’s choosing. Currently there are no standards or vocabularies used in the script writer. This will have to occur. Because every drug information system that is commercially available today follows somewhat different naming conventions, a standardized nomenclature is needed for the smooth exchange of information, not only between organizations, but even within the same organization; RxNorm should be considered for use. The goal of RxNorm is to allow various systems using different drug nomenclatures to share data efficiently at the appropriate level of abstraction. (11) RxNorm contains the description of both prescription and nonprescription formulations.
The NCPDP Script Standard will be used. This is a standard that facilitates the transfer of prescription data between pharmacies and prescribers. The standard will support messaging related to new prescription orders, changes to orders, refill requests, prescription fill status notification, prescription cancellation, medication history, and transactions for long term care environments. (12) This will not only allow for information to be sent to the pharmacy, i.e., fill this prescription for this patient, but will also allow for two-way communication between the pharmacy and the outpatient clinic, i.e., medication has been picked up. Business associate agreements will have to be obtained both at the local and corporate level. HL7 messaging standard - O01 for the placing of the order and O02 for the sending of the response from the pharmacy will be in place. Also, HITSP standards related to medication management interoperability to facilitate access to necessary medication and allergy information for consumers, clinicians, pharmacists, health insurance agencies, inpatient and ambulatory care, etc., will be required to assure compliance for interoperability of data.

After the patient picks up their prescription from the pharmacy, the pharmacy will enter information into their system to that affect. This information will be communicated back to the agency’s electronic medical record. It will upload to the consumer’s medication reconciliation monitoring tool indicating the date the prescription was picked up. Clinicians will be able to run a report containing patient data related to which prescriptions have been picked up and when. This will enhance the medication reconciliation process as the agency will not only be aware of what they wrote scripts for, but also which prescriptions the patient had filled. It should be noted that will only show scripts written by the agency. If part of their identified treatment planning needs are related to treatment non-compliance in medication therapy, alerts could be used to monitor particular patients.

To further enhance the medication monitoring of the patient, a patient personal health record is recommended. This health record will allow the individual to chart their response to therapies, including medications prescribed, describing any positive or negative effects of the medications. They could also track their weight, blood pressure, and glucose levels via entering of the data in their personal health record. The agency will need to create a process for granting individuals access to this information and assure that the individual is who they claim to be. There will need to be a registration process with securities assigned that will allow the patient access only to their information. Besides the ability to enter information related to the outcome of medication therapies, the patient will be able to access information such as list of current and past medications, diagnoses, appointments, and information related to their metabolic monitoring, i.e., height, weight, and blood pressure. The patient will be able to enter all the
usual PHR information such as medical history, family history, outside provider information, etc., and the agency can build in web links that would provide educational information tailored to the behavioral health patient, such as information related to diagnoses, polypharmacy, cardio-metabolic information, diet and exercise, psychotropic medications, behavior therapies and much much more. The PHR will be password protected and compliant with all HIPAA privacy and security regulations, as well as standard HL7 messaging. The application will comply with Health Information Technology for Economic and Clinical Health (HITECH) Act mandates as well. Consents will be required to allow the agency access to their data.

**Solutions Recapitulation:**

The impact on the overall business of these three potential solutions is as follows:

**Solution 1**

To do nothing would satisfy some of the stakeholders, the clinicians who do not want to change current work habits such as handwriting prescriptions, and providing substandard attempts at medication reconciliation. But the key stakeholders, patients, their families, and the overall agency, would not benefit from this solution. It is extremely important to have an accurate accounting and reconciliation of the current medications a patient is being prescribed, both inside and outside the agency. It is also valuable, when prescribing medication, that the clinician have available to them all the clinical knowledge necessary to facilitate best practices in prescribing of medications. This solution would not be chosen by me.

**Solution 2**

I will call this the band aid and duct tape approach. In this approach, we would take all existing systems and current architecture, and use it to the best of our ability. Changes would be required in that agency clinicians would be mandated to use the e-prescribing system. The agency would create medication reconciliation monitoring tool. Information contained within the inpatient pharmacy and PSYCKES application would interface with EMR for use in the outpatient setting. A clinical decision support system, previously described in this paper, would augment the script writer. Clinical decisions related to types of medication, diagnoses, and health indicators, would be made based on information contained within the EMR. Use of clinical decision support e-prescribing, as well as medication reconciliation should assure that evidence-based prescribing practices are occurring, at the time of medication ordering.
Solution 3

E-prescribing to the full extent, meaning transmission of the prescription to the pharmacy with two-way communication between the two entities, although the best way to enhance this process, would not be feasible at this time. This would be a big lift for the agency. There will be the impact on the technology involved, but also in the undertaking of working with various local pharmacies to ensure that all required standards, securities, and regulations are in place. The agency is in the process of completing a gap analysis to ascertain necessary requirements to move off of their agency-designed EMR to outside system. To make any major changes at this point, would be too labor intensive and require necessary resources that will be used in the review and implantation of a new system.
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