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Using SAS to Integrate the LACE Readmissions Risk Score into the Electronic Health Record

Kaiser Permanente:
Data and Information Management Enhancement

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Using SAS to Integrate the LACE Readmissions Risk Score into the Electronic Health Record

Delilah S. Moore, PhD

Kaiser Permanente

ABSTRACT

- The LACE readmission risk score is a methodology used by Kaiser Permanente Northwest (KPNW) to target and tailor readmission prevention strategies for patients admitted to the hospital.
- The purpose of this presentation is to share how KPNW used SAS in combination with Epic's Datalink to integrate the LACE score into it's electronic health record (EHR) for usage in real-time.
- The LACE score is an objective measure, composed of four components including: (L) length of stay, (A) acuity of admission, (C) pre-existing co-morbidities, and (E) ED visits in the prior 6 months.
- SAS was used to perform complex calculations and combine data from multiple sources (which was not possible for the EHR alone), then calculate a score which was integrated back into the EHR.
- The technical approach includes a trigger macro to kick off the process once the database ETL completes, several explicit and implicit proc SQL statements, a volatile temp table for filtering, and a series of proc sort, proc means, proc transpose, and proc export steps.
- We will walk through the technical approach taken to generate and integrate the LACE score into Epic as well as describe the challenges we faced, how we overcame them, and the beneficial results we have gained throughout the process.

METHODS

- The daily SAS process is scheduled to run after a Clarity token drop macro is triggered, alerting the job that the Clarity ETL process has completed and the database tables have been updated
- A master date macro is utilized at the beginning of the SAS process to allow for easier job recovery when the process needs to be rerun for dates in the past (i.e., database outages)
- The base query, an explicit proc SQL passthrough, connects to the Clarity database and identifies the patient population to receive a LACE score, which includes:

1. All patients in KP-owned hospitals starting the day following admission until 2 days after discharge
2. Inpatient and Observation status – excludes Ambulatory Surgery Center (ASC) admissions

LACE Component	HealthConnect Field/Data Source	Points allocated
Length of Stay	• LOS from the present admission • KPHC Item #2446 –calculated field based on the admission and discharge date, using the following logic: Operator: < Value: 1 Result Type: Number Result: 0 Operator: < Value: 2 Result Type: Number Result: 1 Operator: < Value: 3 Result Type: Number Result: 2 Operator: < Value: 4 Result Type: Number Result: 3 Operator: <= Value: 6 Result Type: Number Result: 4 Operator: <= Value: 13 Result Type: Number Result: 5 Operator: >= Value: 14 Result Type: Number Result: 7	• 0 to 7
Acuity of Admission	• Was the patient admitted to hospital via the ED? o Yes = 3 points o No = 0 points • ADT 18875 (Hospital – Admission Type) EPT item 18875 = Emergency or Urgent	• 0 or 3
Charlson comorbidity index	• Sourced from all active and historic problems on the KPHC problem list (inpatient and ambulatory) and encounter diagnoses in the last 1 year • Scoring for LACE used the point allocations from van Walraven et al., 2010 with KPNW modification for DM w/ complications. • See Comorbidities Condition and Score grid below	• 0 to 5
ED visits in prior 180 days	• Data source: DIME.DDID Inpatient mart* o *ED visits at KP facilities are sourced from KPHC o *ED visits from outside hospitals are sourced from insurance claims • Total ED visits in the six months prior to admission (not including the ED visit immediately preceding the current admission) • All ED visits in KP facilities and outside hospitals in the last 6 months are included • If > 1 ED visit on the same day, only 1 ED visit is counted per day • KPHC data is lagged one day, Claims data is lagged up to 8 weeks • ED visits could be underrepresented from outside hospitals if we have not received a claim	• 0 to 4
Total LACE score	• Finalized on discharge o **Low risk = 0 – 6** o **Medium risk = 7 – 10** o **High risk = 11 – 19**	• 0 to 19

Analytical Feeds to KPHC

- Calculations are performed for the L (Length of Stay) and A (Acuity of Admission) components to assign points
- To identify the diagnoses that are part of the "C" calculation, a volatile table was created (for faster filtering) and joined to the Problem List and Encounter diagnoses tables
- ED visits in the last 6 months are pulled in from the data warehouse using an implicit proc sql query
- The LACE Total score is calculated and an Oracle table is appended with the output from that day's run
- Eight text files with a list of Health Record Numbers (HRNs) for the C and E components are created and ftp'd to a landing zone for import into the EHR

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NW Transition Care Bundle Risk Stratification

Bundle Elements		Low	Medium	High (CHF, readmitted within 30 days, gestalt)
	LACE	0-6	7-10	11-19
	Care Group 4			√
	Cognitive Issues			√
1. Risk Stratification		√	√	√
2. Special Transitions Number		√	√	√
3. Standardized Discharge Summary		√	√	√
4. Medication Reconciliation		√	√	√
Pharmacist medication reconciliation				√
5. Post Hospital Visit with Primary Care Provider			≤ 10 days	≤ 5 days
6. Follow Up phone call within 72 hours		√	√	√
MD phone call				≥18
Palliative Care Consult (if indicated)				LACE ≥ 15
Complex Case Conference with care planning				√
Transitional Paramedicine Visit within 24-48 hrs				√
iPad issued for follow up				√

11-Jul-13 1

DRAFT

RESULTS

- After the SAS process completes, the files are consumed by the EHR and stored as health maintenance modifiers that are pulled into a print group that calculates the total LACE score in real time.
- The LACE score is available for analytical reporting via the Oracle table and is available for real-time operational reporting within the EHR
- The LACE score is presented in a suite of reports that support the KPNW Transitions in Care Program and is also presented in several different locations in the EHR including the following:

1. It can be viewed in Chart Review at the bottom of the Admission Summary Report
2. The score and table are viewable in the Patient Summary Report, following the print group called Nw Ip Discharge Readiness.
3. LACE can also be viewed via the smartlink .readmission score
4. The LACE score was added as a column to the Daily Inpatient Census List

Appearance in Chart Review:

08/15/13 0710	Surgery	Inpatient	SMC MAIN OR	SMC
08/15/13 0845	Transfer Out	Inpatient	SMC-SPU	SPU
08/15/13 0845	Transfer In	Inpatient	SMC-OR	SMC
08/15/13 0953	Transfer Out	Inpatient	SMC-OR	SMC
08/15/13 0953	Transfer In	Inpatient	SMC-PACU	SMC
08/15/13 1051	Transfer Out	Inpatient	SMC-PACU	SMC
08/15/13 1051	Transfer In	Inpatient	SMC-2S	224

Readmission Score (LACE)

Readmission Score (LACE):	7
L-LENGTH OF STAY NW:	4
A-EMERGENT ADMISSION SCORE NW:	
C-CHARLSON COMORBIDITY SCORE NW:	1
E-NUMBER OF ED VISITS SCORE:	2

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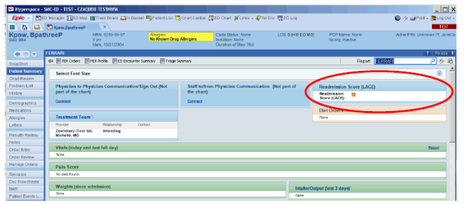
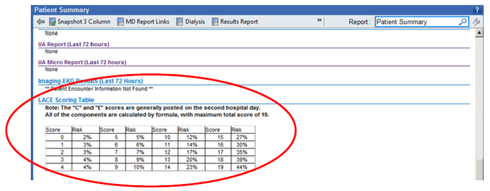
RESULTS CONTINUED

Reports in Which the LACE Score Appears

- **NW IP MD OVERVIEW / FERRARI REPORT** [5008675], [5028675]

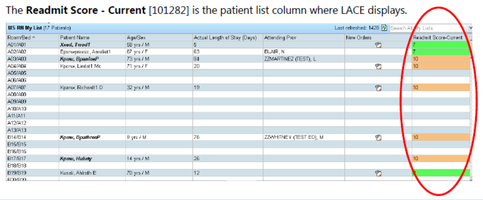


- **PATIENT SUMMARY REPORT MD NW IP** [50245200]



Patient List Column in Which LACE Score Appears

The **Readmit Score - Current** [101282] is the patient list column where LACE displays.



- Some of the challenges of the project included:
- Determining who gets a score and the timing of when it would be viewable
- How to define individual components using our KPNW data and external claims information when available
- How to capture the LACE score at discharge, transfer it across care settings and use to enhance care
- The calculation continuously updates so once a patient discharges there is no L score available and the score within the EHR is not correct.
- How to capture acuity of urgent direct admits that do not come through the ED?
- Where to pull current diagnoses from EMR?
- Determine best way to feed the C and E components back into the EHR
- Determining appropriate placement of the score within the EHR and in existing reports to get it in front of the right audiences who could act on the information while a patient was in the hospital up until 48 hours post discharge

CONCLUSIONS

- The LACE score in KPNW's instance of Epic is used by multiple stakeholders including physicians in the hospital, Inpatient Care Coordinators, Transition Pharmacists, Transition RNs, and Primary Care Providers to intervene on high risk patients while they are in the hospital
- SAS allowed KPNW to extract patient information from the EHR, conduct complicated calculations on the data, then feed the results of the calculations back into the EHR for action in real-time
- The LACE score launched in July 2014 and is continuing to be used to plan new clinical interventions to reduce risk of hospital readmission.
- The KP Center for Health Research is partnering with KPNW Operations to validate our implementation of the score to determine how effective it is at predicting readmission or death within 30 days.
- Successful implementation and adoption of the LACE score was dependent on the strong partnerships between analytics, informatics and local physician champions.
- Communications strategy and job aids were created to encourage adoption and appropriate use of the score by end users.

REFERENCES

- Quan et al., "Coding Algorithms for Defining Comorbidities in ICD-9-CM and ICD-10 Administrative Data", Medical Care:43(11), Nov. 2005 p1130-1139.
- van Walraven C, Dhalla IA, Bell C, et al. Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community. CMAJ. 2010 Apr 6,182(6):551–7. http://doi.org/10.1503/cmaj.091117

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