EXAMPLES OF FHIR-BASED SOLUTIONS FROM THE UNIVERSITY OF UTAH

2018 UNIVERSITY OF WASHINGTON FHIR WORKSHOP
SEPTEMBER 24, 2018

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DISCLOSURES

- In the past year, I have been a consultant or sponsored researcher on clinical decision support for ONC*, Hitachi, McKesson InterQual, and UC San Francisco
- Several of the apps, services, and tools described are being commercialized to enable wider impact

*via various subcontractors

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NEONATAL BILIRUBIN APP

- Goal: improve neonatal bilirubin management and prevent neurotoxicity
- Iteratively enhanced based on user requests
- Estimated to save >300 hrs of MD time/yr
- Awarded HHS Provider User Experience App Challenge Awards (link)

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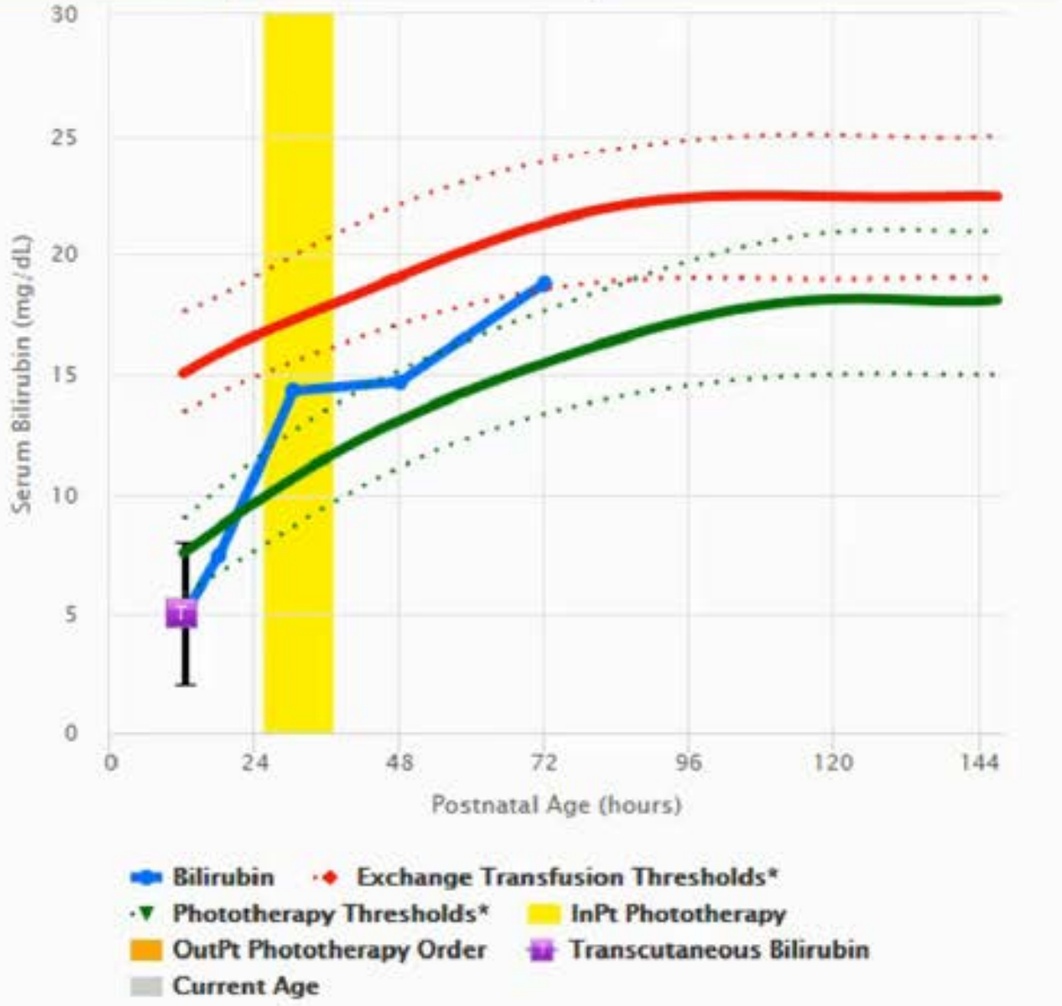
Bilirubin App

Neurotoxicity Risk | Hyperbilirubinemia Risk

Print



*Bold = patient-specific threshold.

Source: AAP Hyperbilirubinemia Management Guidelines. Pediatrics. 2004;114:297-316.

Gest. Age

○ < 35 wks ○ 35-37 wks ◉ 38 wks+

Direct Coombs (risk factor)

◉ Pos. *(01/01/16)* ○ Neg. ○ Unknown

	Blood Type	Indirect Coombs
Baby	B Pos (01/01/16)	Positive (01/01/16)
Mother	O Neg (04/09/15)	Positive (04/09/15)

Other neurotoxicity risk factors?

- Acidosis
- Asyphyxia
- G6PD deficiency
- Isoimmune hemolytic disease
- Sepsis
- Sig. lethargy
- Temp. instability

○ Present ○ Not Present

Albumin < 3.0 g/dL (risk factor for phototherapy only)

○ Yes ◉ No ○ None on record

Phototherapy recommended.

Rationale: Patient's latest total serum bilirubin level of 18.8 mg/dL at 72 hrs is above treatment threshold for phototherapy (15.48) given gestational age >= 38 wks with risk factors for phototherapy.

Clinical Prediction Rule for Rebound Hyperbilirubinemia

- **Risk Score: 55.84 (above threshold of 20)**
- Predicted risk of rebound hyperbilirubinemia after phototherapy: **ELEVATED (> 4%)**
- Based on paper on probability of return of total serum bilirubin (TSB) to phototherapy threshold within 72 hours of phototherapy termination (Chang et al. A Clinical Prediction Rule for Rebound Hyperbilirubinemia Following Inpatient Phototherapy.

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PROCEDURE SCHEDULE MANAGEMENT APP

- Goal: enable efficient procedure scheduling based on available capacity
- Initial focus: electroconvulsive therapy (ECT)
- Support for custom capacity rules and manual over-rides

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SURGICAL REFERRAL DASHBOARD

- Goal: enhance communication between surgeons and referring providers
- Builds on prior research on information needs and issues with traditional approach
- ONC High Impact Pilot (PIs: Brooke, Del Fiol)
- Covers PCP → surgeon and surgeon → PCP communication

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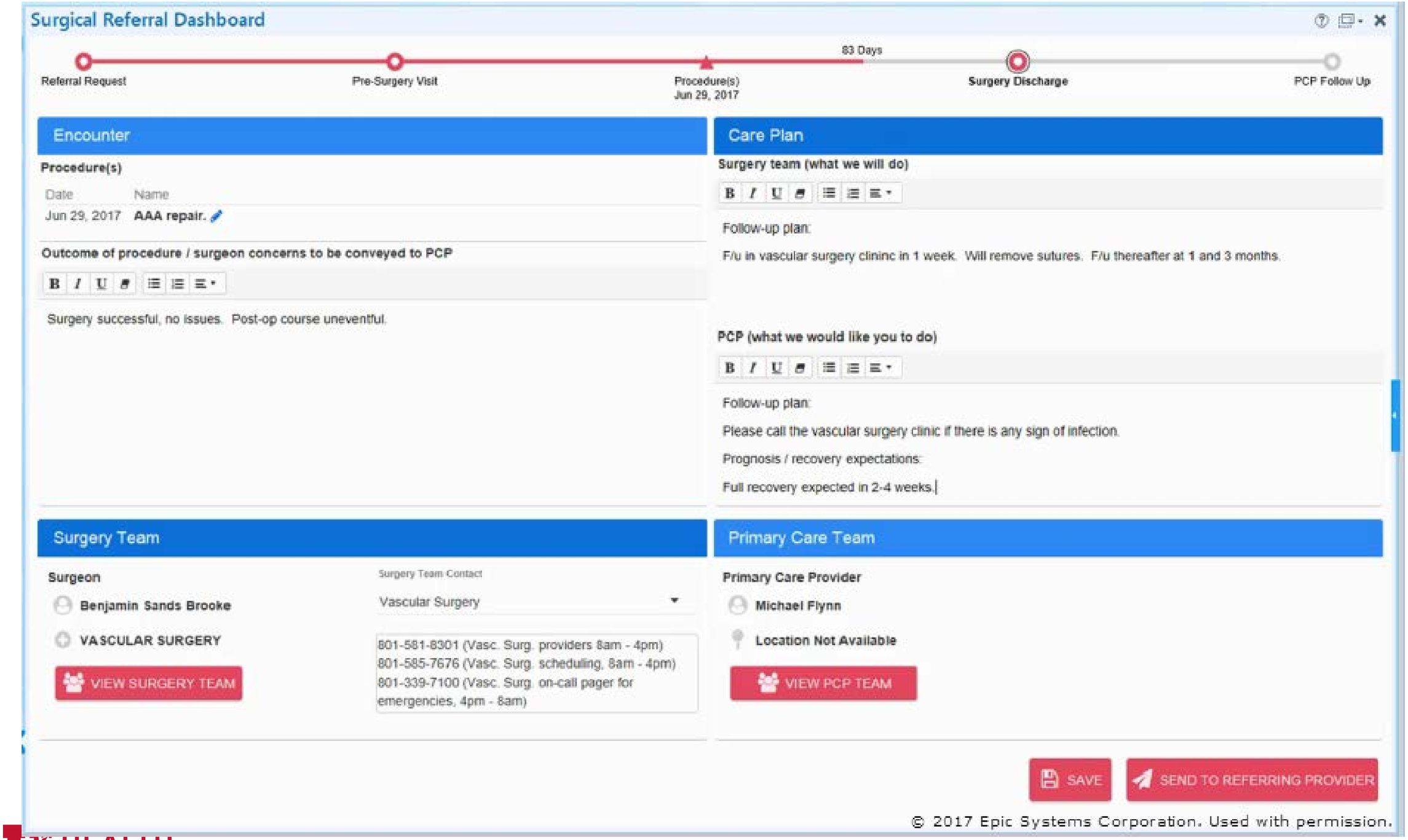

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MDCALC EHR INTEGRATION

- Goal: enable seamless integration of medical calculations within clinical workflows
- MDCalc: leading medical calculation tool
  - > 1 million monthly users from 196 countries
  - 35+ specialties, 200+ conditions

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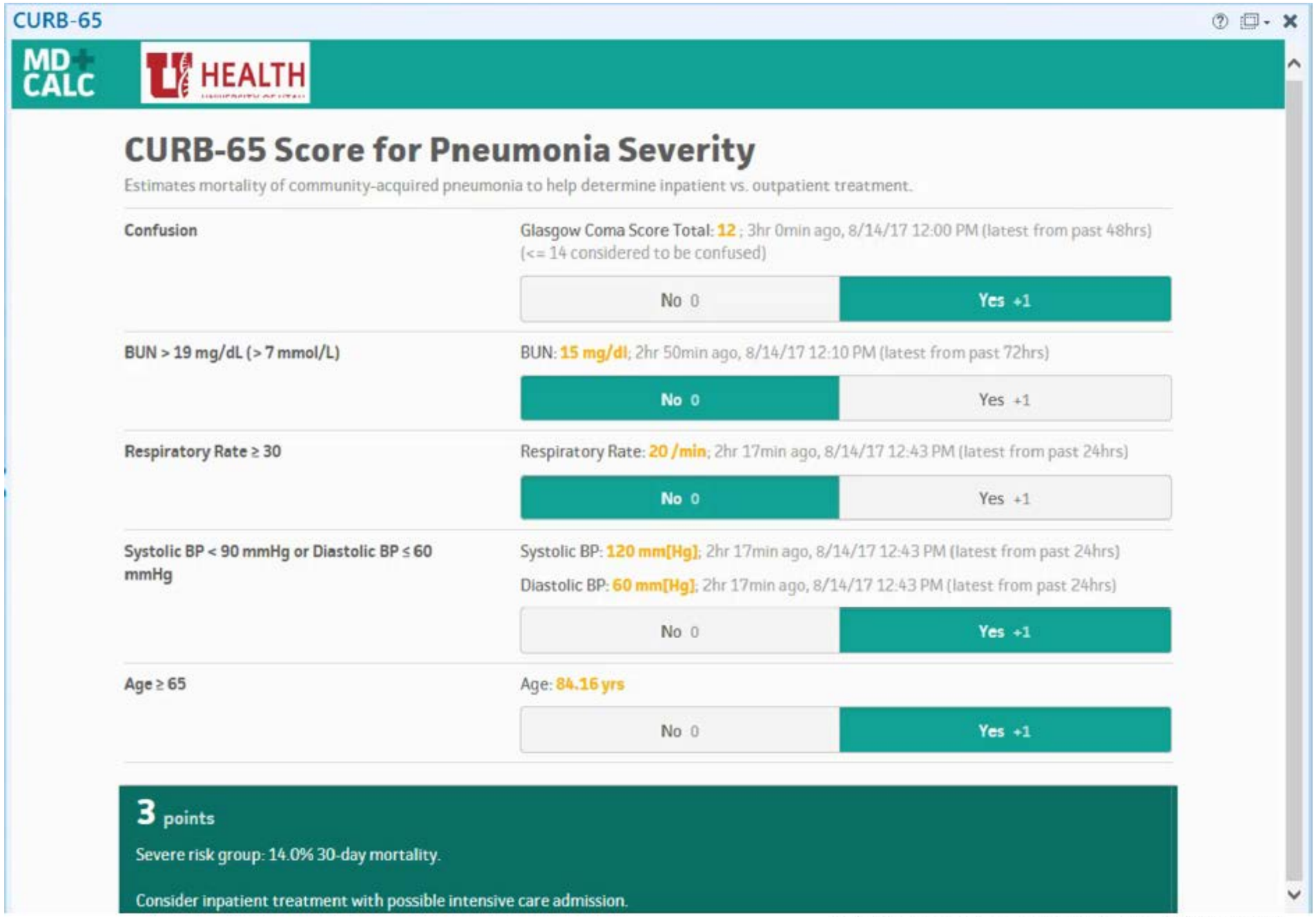

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DIABETES MANAGEMENT DASHBOARD

- Goal: assist clinicians with diabetes management decision making
- Collaboration with Hitachi, Ltd. Data Science team
- Developed and leveraging predictive models of therapy outcomes with AUC of 0.87

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Next Goal | 7.0% | in 6 mo. | Med. Option | Options Comparison

Current

MET

62% Success rate

22%

39%

Benefits
Low risk of low blood sugar

Risks
Stomach discomfort, diarrhea

$ $5 /Mo

AETNA
Coverage Information

− MET
Metformin ER 1000 mg ***high medication cost
Metformin ER 500 mg
Metformin ER 750 mg
Metformin IR 1000 mg
Metformin IR 500 mg
Metformin IR 850 mg

MET GLP-1

34% Success rate

34%

Benefits
Low risk of low blood sugar

Risks
Stomach discomfort, diarrhea
Nausea

$ $ $ $ $716 /Mo

AETNA
Coverage Information

− GLP-1
Trulicity 0.75 mg/0.5ml, 1.5 mg/0.5ml (QL)
Victoza (QL)

MET DPP-4

57% Success rate

57%

Benefits
Low risk of low blood sugar

Risks
Stomach discomfort, diarrhea
Allergic reaction (rare)

$ $ $373 /Mo

AETNA
Coverage Information

− MET,DPP-4
Janumet (QL)
Janumet XR 100-1000 mg, 50-1000 mg, 50-500 mg (QL)
− DPP-4
Januvia (QL)
Onglyza (QL)
Tradjenta (QL)

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OPIOID DECISION SUPPORT

- Goal: provide point-of-care support for CDC guideline on opioid use for chronic pain outside of active cancer treatment, palliative care, or end-of-life care

https://www.cdc.gov/drugoverdose/prescribing/guideline.html

- CDC-sponsored effort. Partners: ONC, Yale, ESAC.
- http://build.fhir.org/ig/cqframework/opioid-cds/

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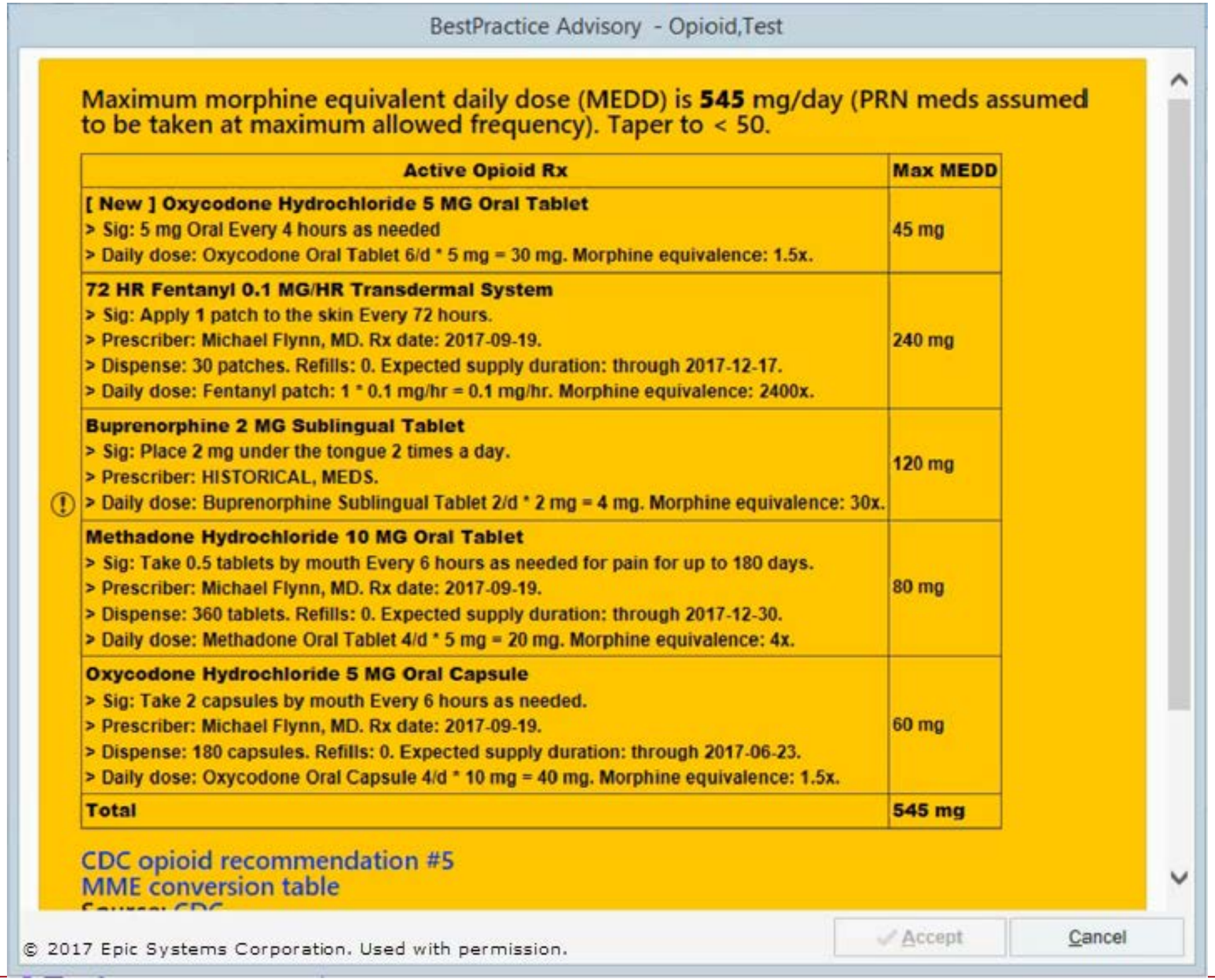

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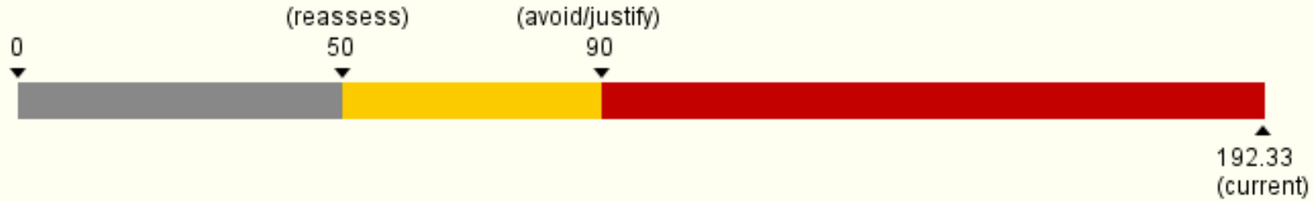
BestPractice Advisory - Testpatient,Opioid1

Patient's average oral morphine equivalence (OME) is **192.33** mg/day.

Daily Average OME (mg/day)



For adults, CDC recommends reassessing evidence of individual benefits and risks when increasing dosage to >= 50 OME/day, and avoid increasing dosage to >= 90 OME/day or carefully justifying such a decision.

Active Opioid Rx	Avg OME/day*
New **Oxycodone Hydrochloride 15 MG Oral Tablet**	135 mg
FENTANYL CITRATE 200 MCG BU LPOP	17.33 mg
⚠ Verify taking; Rx may have expired	
HYDROCODONE-ACETAMINOPHEN 10-325 MG PO TABLET	40 mg
⚠ Verify taking; Rx may have expired	
⚠ Not adding OME for presumed redundant Rxs with start dates of 02/07/18 and 03/07/18.	
Total Average OME/Day	192.33 mg

*Avg OME = (qty dispensed)/(days supply). 30d supply assumed unless otherwised noted in Sig or note to pharmacy.

*Max OME (see details) = max amount patient may take on a given day according to Sig, even if patient runs out of med early.

OME conversion table
CPG opioid Rx guideline
Source: CDC opioid Rx guideline -- recommendation #5

✔ Accept | Cancel

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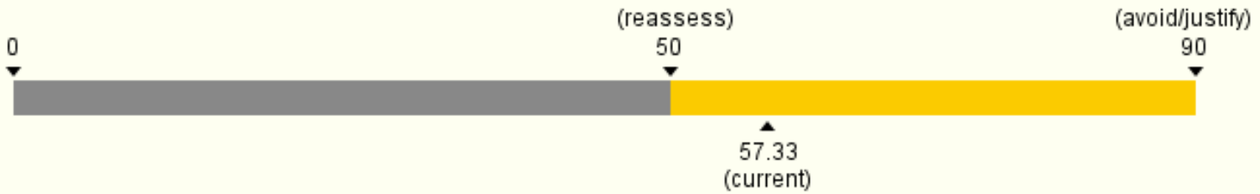
Outpatient Opioid Oral Morphine Equivalence (OME) Calculator

Patient's average oral morphine equivalence (OME) is **57.33** mg/day.

Daily Average OME (mg/day)



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Total Average OME/Day	**57.33 mg**

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LESSONS LEARNED AND FUTURE DIRECTIONS

- FHIR-based solutions hold great potential for improving patient care and provider experience
  - Important complement to traditional EHR optimization
- Areas of current and planned focus:
  - Evaluation
  - Widespread dissemination and deployment
  - Many more apps and services
  - Disease Management Dashboard
    - Decision support,1-click documentation and ordering

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THANK YOU!

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