



Automatically Generating Narrative Documentation for Medical Procedures



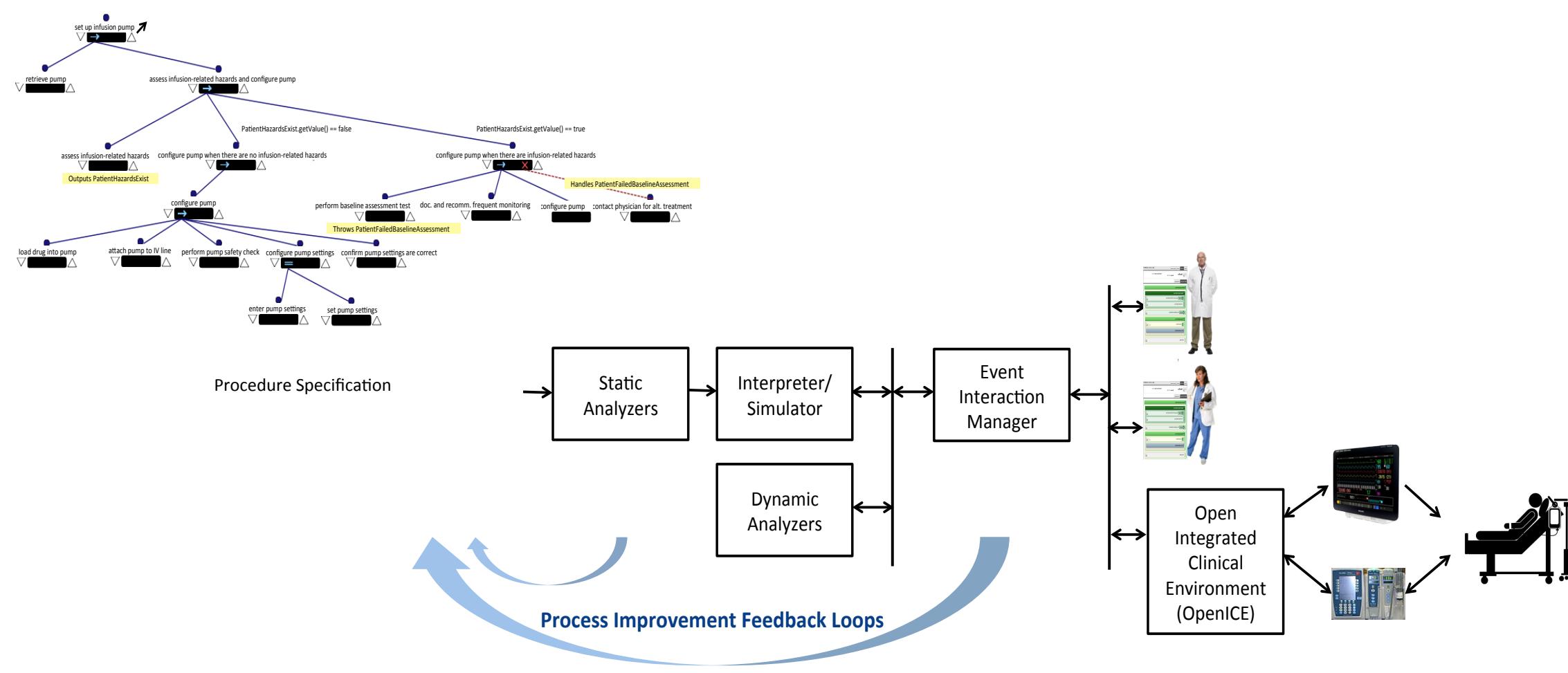
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Introduction

Background:



Problem Statement and Impact: Extend the Smart Checklist procedure-monitoring system to automatically generate post-procedure documentation. Which will:

- reduce time demands on healthcare workers and
- improve accuracy of post documentation

by automatically capturing the path a procedure takes, relevant patient data, and decisions and notes made by healthcare clinicians

Example : Blood transfusion procedure

Related Work

Checklists



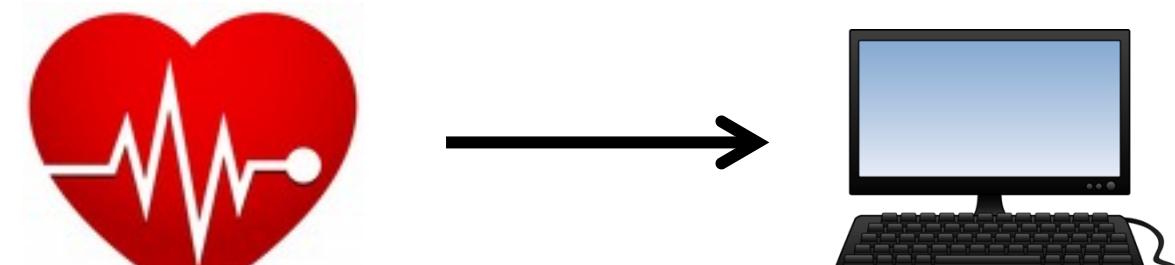
Tables

Name	Value
Date	2015-06-10
Weight	70kg
Time	10:47am
BP	120/95
Pulse	85 bpm
SpO2	98.5%
Comments	
Nurse	Jane Smith

Data Provenance^[7]

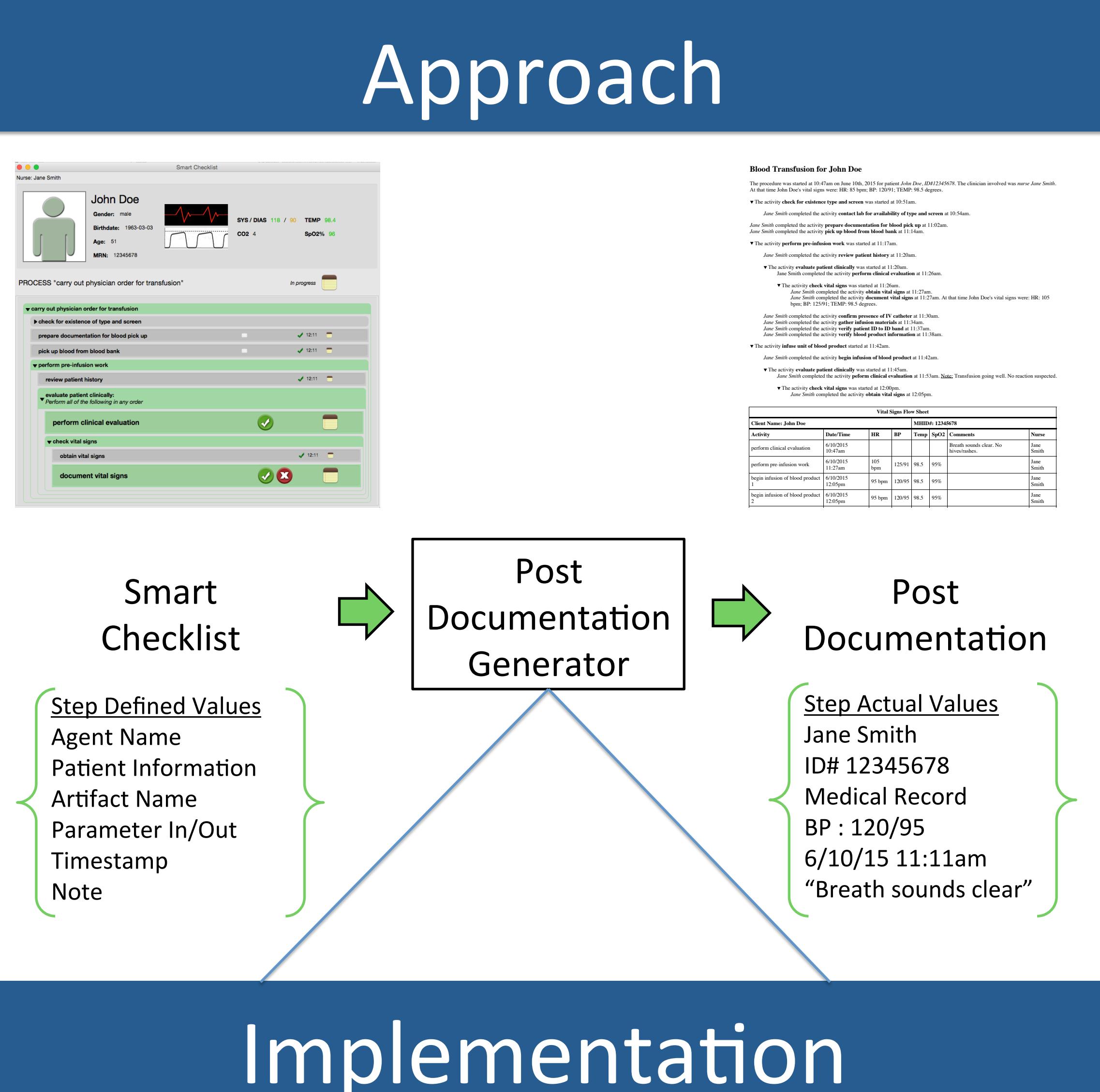


Automatic Recording of Vital Signs to Electronic Medical Records



Medical Scribe

Approach



Implementation

- Generate XML from execution steps based on Smart Checklist
- Use XSLT to translate XML to different HTML views

▼ Evaluate patient clinically	6/10/2015	11:20am	Jane Smith	
Perform clinical evaluation	6/10/2015	11:26am	Jane Smith	Breath sounds clear. No hives/rashes noted.

▼ The activity **evaluate patient clinically** was started at 11:20am.
Jane Smith completed the activity **perform clinical evaluation** at 11:26am.

Activity	Date/Time	HR	BP	Temp	SpO2	Comments	Nurse
perform clinical evaluation	6/10/2015 10:47am					Breath sounds clear. No hives/rashes.	Jane Smith

Conclusions

Limitations:

- No current documentation standards
- Differs between processes and domains

Blood Transfusion for John Doe

Blood Transfusion Flow Sheet					
Client Name: John Doe	MRID#: 12345678	Activity	Date	Time	Clinician
		Start	6/10/2015	10:47am	Jane Smith
▼ Check for existence type and screen		6/10/2015 10:51am	Jane Smith		
Contact lab for availability of type and screen		6/10/2015 10:54am	Jane Smith		
Prepare documentation for blood pick up		6/10/2015 11:07am	Jane Smith		
Pick up blood from blood bank		6/10/2015 11:17am	Jane Smith		
▼ Perform pre-infusion work		6/10/2015 11:17am	Jane Smith		
Review patient history		6/10/2015 11:20am	Jane Smith		
▼ Evaluate patient clinically		6/10/2015 11:20am	Jane Smith		Breath sounds clear. No hives/rashes noted.
Perform clinical evaluation		6/10/2015 11:20am	Jane Smith		
▼ Check vital signs		6/10/2015 11:27am	Jane Smith		
Obtain vital signs		6/10/2015 11:27am	Jane Smith		
Document vital signs		6/10/2015 11:27am	Jane Smith		
Confirm presence of an IV catheter		6/10/2015 11:30am	Jane Smith		
Gather infusion materials		6/10/2015 11:34am	Jane Smith		
Verify patient ID to ID band		6/10/2015 11:37am	Jane Smith		
Verify blood product information		6/10/2015 11:38am	Jane Smith		
▼ Infuse unit of blood product		6/10/2015 11:42am	Jane Smith		

Blood Transfusion for John Doe

The procedure was started at 10:47am on June 10th, 2015 for patient John Doe, ID#12345678. The clinician involved was nurse Jane Smith. At that time John Doe's vital signs were: HR: 85 bpm, BP: 120/91, TEMP: 98.5 degrees.

▼ The activity check for existence type and screen was started at 10:51am.

Jane Smith completed the activity contact lab for availability of type and screen at 10:54am.

Jane Smith completed the activity prepare documentation for blood pick up at 11:02am.

Jane Smith completed the activity pick up blood from blood bank at 11:14am.

▼ The activity perform pre-infusion work was started at 11:17am.

Jane Smith completed the activity review patient history at 11:20am.

▼ The activity evaluate patient clinically was started at 11:20am.

Jane Smith completed the activity perform clinical evaluation at 11:26am.

▼ The activity check vital signs was started at 11:26am.

Jane Smith completed the activity obtain vital signs at 11:27am.

At that time John Doe's vital signs were: HR: 105 bpm, BP: 125/90, TEMP: 98.5 degrees.

▼ The activity document vital signs was started at 11:27am.

Jane Smith completed the activity verify vital signs at 11:38am.

▼ The activity infuse unit of blood product was started at 11:42am.

Jane Smith completed the activity begin infusion of blood product at 11:42am.

▼ The activity evaluate patient clinically was started at 11:45am.

Jane Smith completed the activity perform clinical evaluation at 11:53am.

At that time John Doe's vital signs were: HR: 105 bpm, BP: 125/90, TEMP: 98.5 degrees.

▼ The activity check vital signs was started at 12:00pm.

Jane Smith completed the activity obtain vital signs at 12:05pm.

▼ The activity vital signs flow sheet was started at 12:05pm.

Jane Smith completed the vital signs flow sheet at 12:05pm.

Vital Signs Flow Sheet

Client Name: John Doe MRID#: 12345678

Activity Date/Time HR BP Temp SpO2 Comments Nurse

perform clinical evaluation 6/10/2015 10:47am 105 bpm 120/91 98.5 95% Jane Smith

perform pre-infusion work 6/10/2015 11:17am 105 bpm 120/91 98.5 95% Jane Smith

begin infusion of blood product 1 6/10/2015 11:42am 95 bpm 120/95 98.5 95% Jane Smith

begin infusion of blood product 2 6/10/2015 12:05pm 95 bpm 120/95 98.5 95% Jane Smith

perform post-infusion work 6/10/2015 12:18pm 87 bpm 120/95 98.5 95% Jane Smith

References

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- [7] L.J. Osterweil, L.A. Clarke, A.M. Ellison, R. Podorozhny, A. Wise, E. Boose, J. Hadley, "Experience in using a process language to define scientific workflow and generate dataset provenance." *ACM SIGSOFT International Symposium on Foundations of Software Engineering*, November 2008, pp. 319-329.