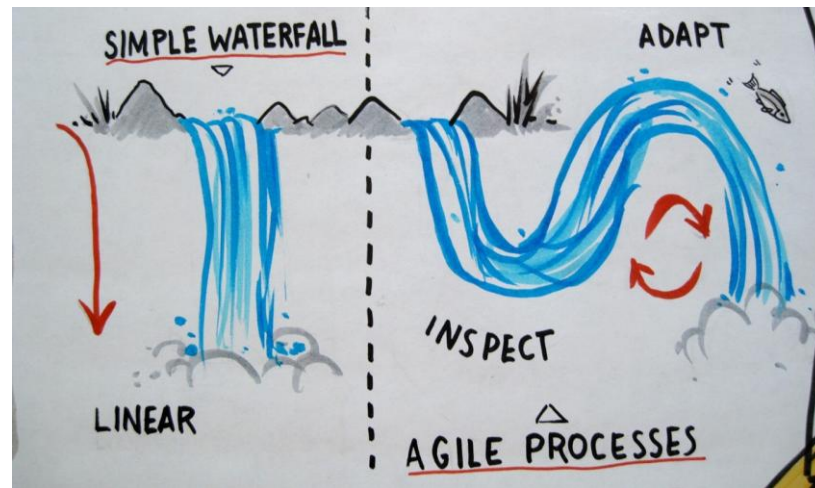# Applying Lean to EHR Design and Implementation

Keith Dipboye

Goals

- How do waterfall EHR projects go wrong?

- What is Lean, and what is Agile?

- How can lean/agile reduce risk and improve products?

- What are the challenges of introducing non-waterfall methodology to an EHR project?

- Discussion

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TRANSFORMATION
Our path to smarter, seamless care

Virginia Mason, 1999-2016

880 Saskatchewan health care leaders study Lean at Virginia Mason | The StarPhoenix

See on **Scoop.it** - lean manufacturing

"Close to 900 health workers will make the pilgrimage to Seattle in search of factory efficiency for hospitals. Take a look inside at the origins of the world's biggest health quality experiment. [...] With Virginia Mason as their model, the treks are part of a sweeping overhaul of how the provincial health system is managed. [...]More than a decade into a journey that's never really finished, Virginia Mason now makes it its business to teach health care leaders from all over the world about the Virginia Mason Production System."
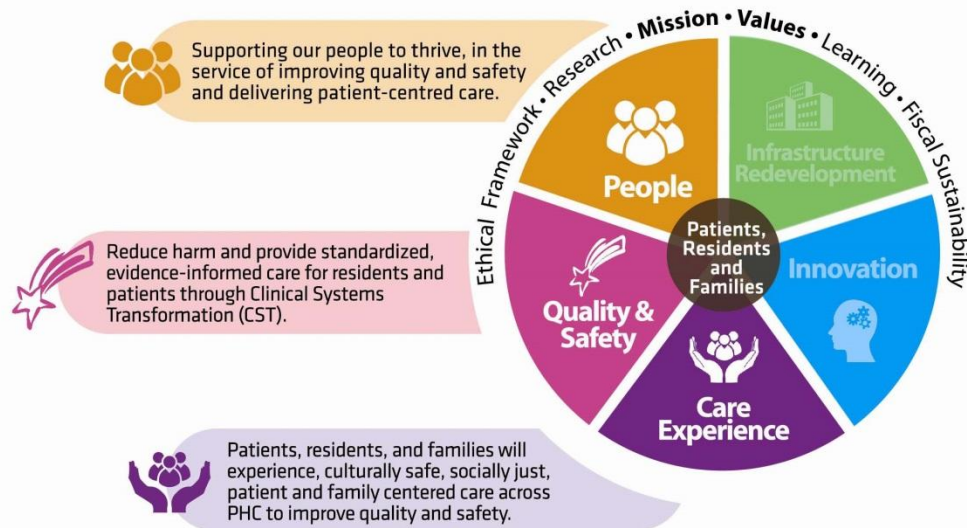
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CST is a joint initiative of three health organizations

Vancouver CoastalHealth
Promoting wellness. Ensuring care.

Providence HEALTH CARE
How you want to be treated.

Providence Plan
Areas of Focus

Supporting our people to thrive, in the service of improving quality and safety and delivering patient-centred care.

Reduce harm and provide standardized, evidence-informed care for residents and patients through Clinical Systems Transformation (CST).

Patients, residents, and families will experience, culturally safe, socially just, patient and family centered care across PHC to improve quality and safety.

Mission • Values • Learning • Fiscal Sustainability • Innovation • Care Experience • Quality & Safety • People • Ethical Framework • Research

Patients, Residents and Families

Provincial Health Services Authority
Province-wide solutions. Better health.

promote better health for our communities

provide the best care

develop the best workforce

innovate for sustainability

people first

PHSA Key Directions

1. Improve quality outcomes and value for patients
2. Promoting healthier populations
3. Contributing to sustainable health care system

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11,100 NURSES

5,800 PROVIDERS

3,600 OTHER

1,900 RESEARCH & STUDENTS**

400 PHARMACISTS

400 Management

2,800 ALLIED HEALTH

500 HIM

3,400 CLERICAL

600 LAB

3,200 CARE ASSISTANTS

CLINICAL + SYSTEMS **TRANSFORMATION**
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Waterfall design

Define → Build → Release → VALUE

risk

TIME

| Gather requirements | Create IPP | Write specs | Build | Test | User validation | Learning curriculum | Deploy |

CLINICAL + SYSTEMS **TRANSFORMATION**
Our path to smarter, seamless care
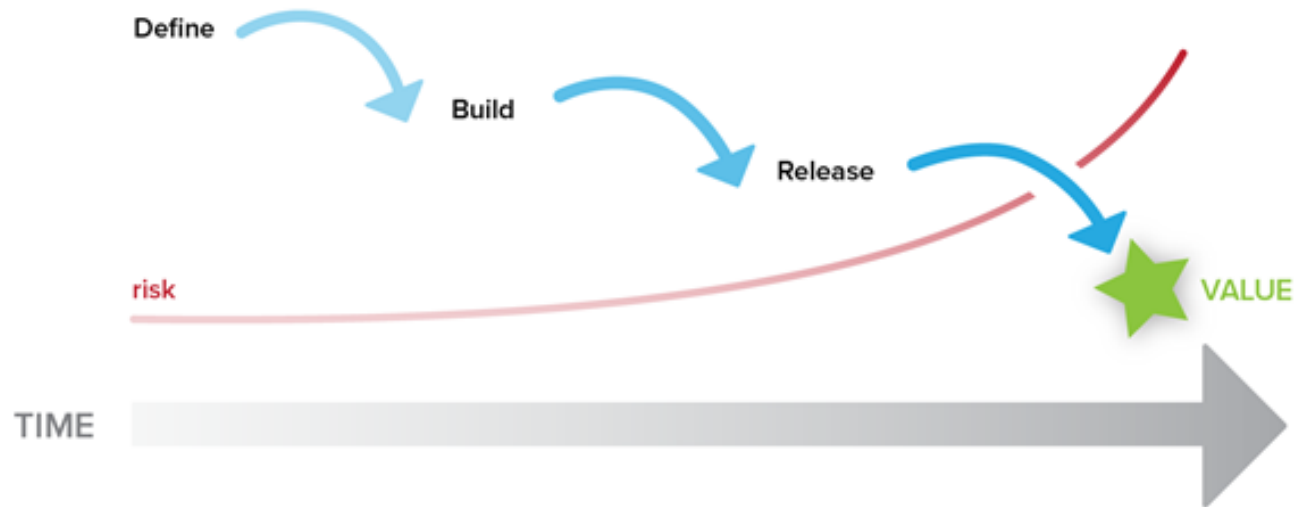
Waterfall design

What the clinician group described

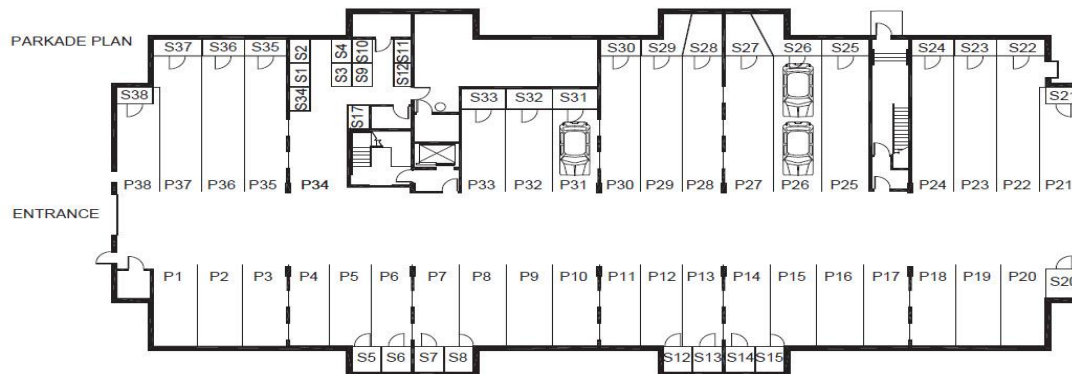Fully integrated go-live functionality

What an experienced user wants

What the programmer built

Re-design after "optimization"

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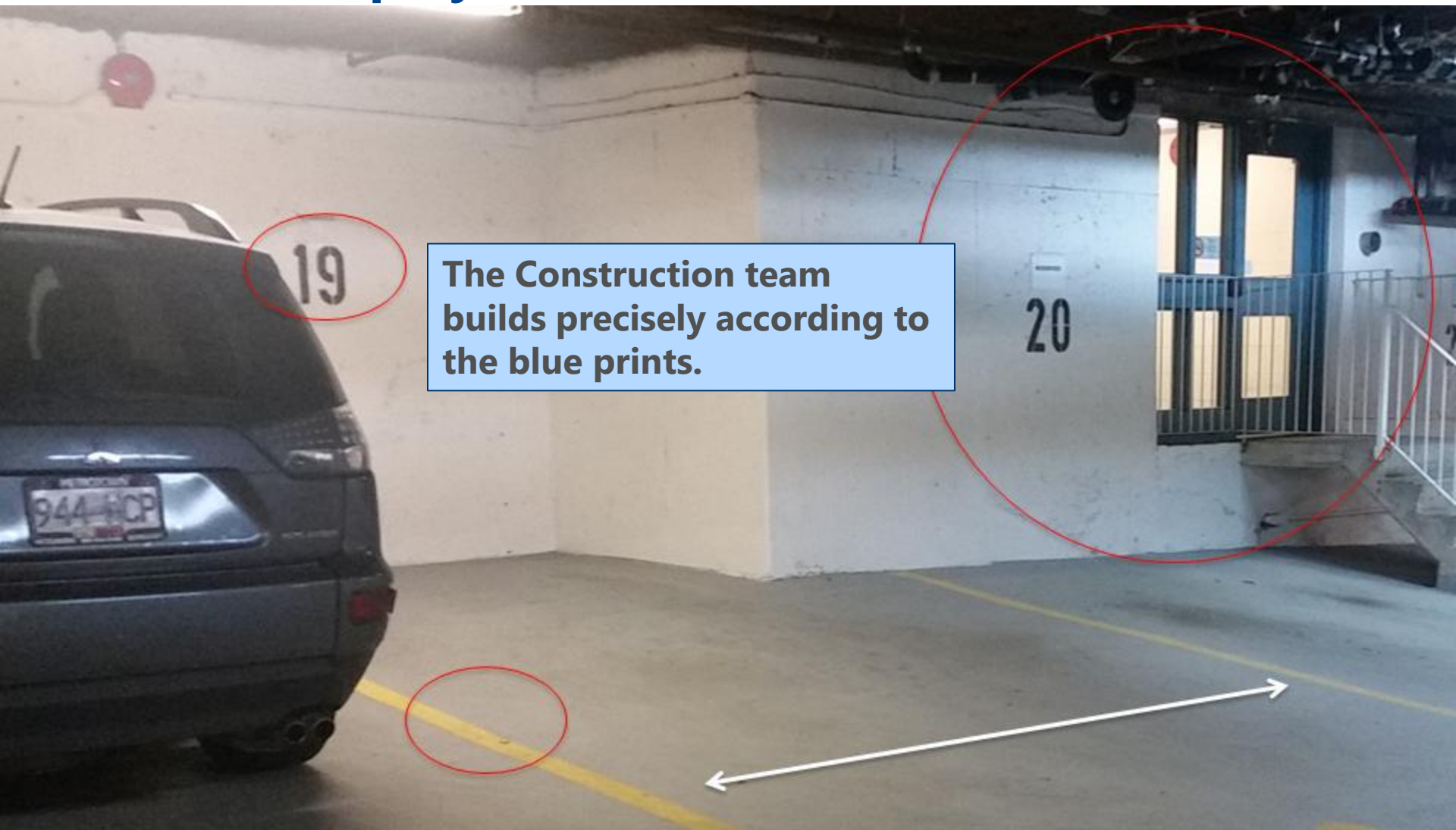Our path to smarter, seamless care

We are designing a parking garage

- Gather requirements – e.g. Handicapped parking

- Certify requirements

- Create specs (blueprint)

  = 1000 person hours

- Begin construction

CLINICAL + SYSTEMS
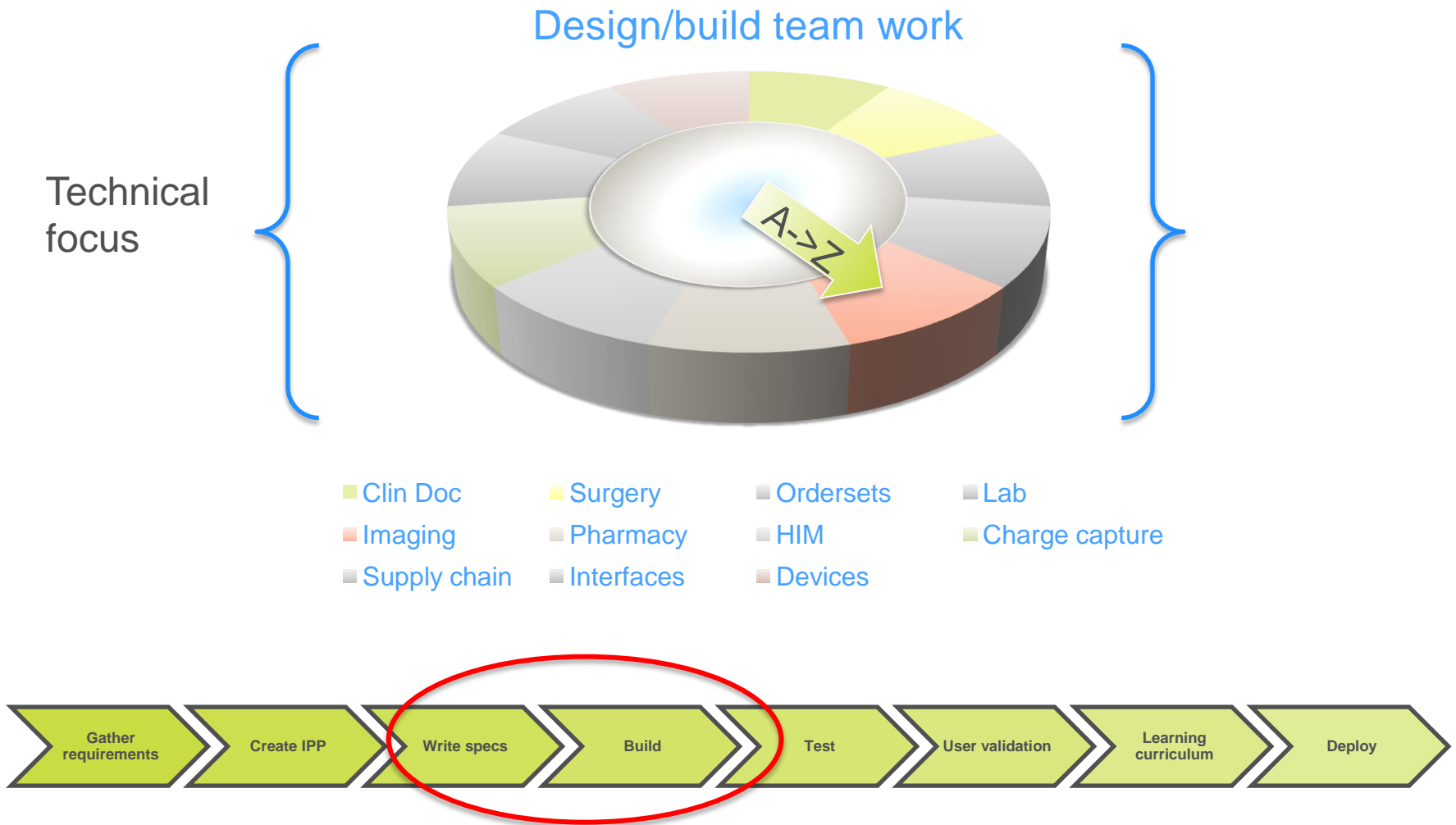**TRANSFORMATION**
Our path to smarter, seamless care

"Successful project"

The Construction team builds precisely according to the blue prints.
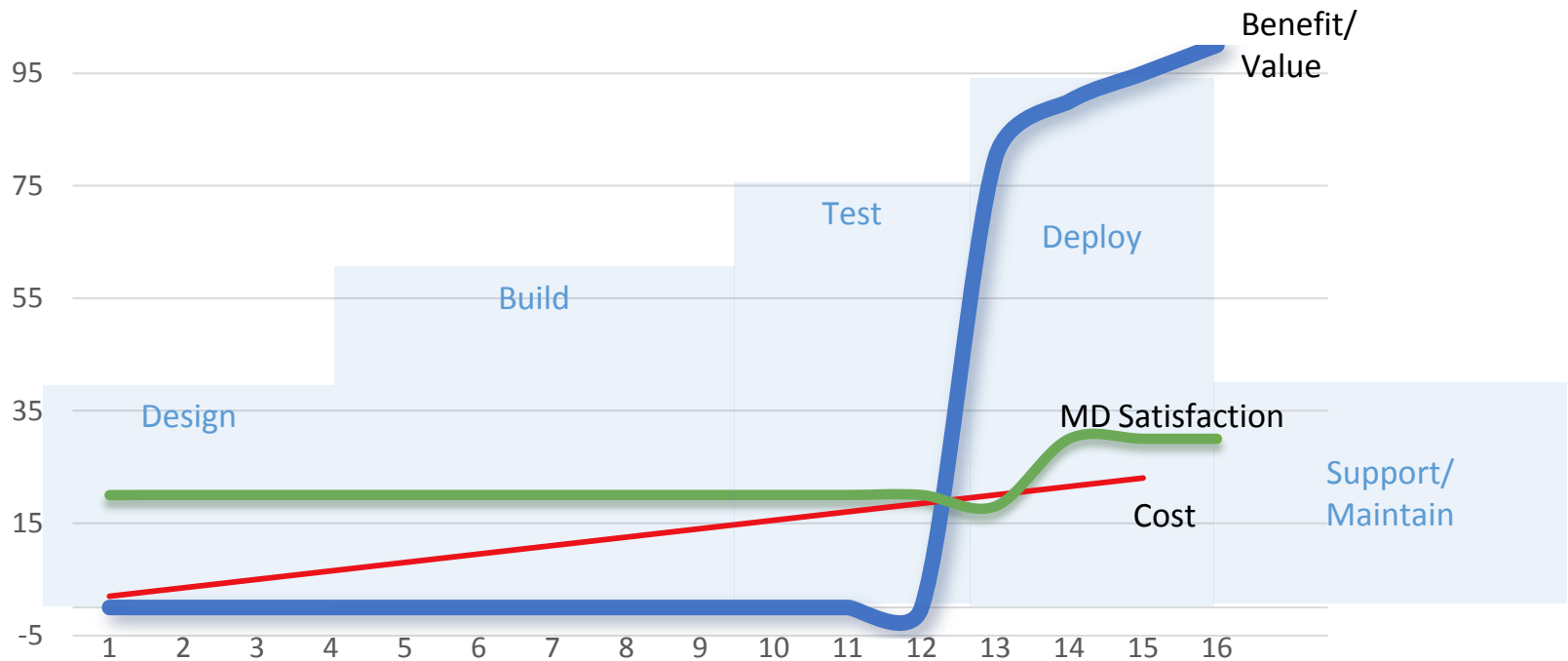
"Successful project"

What if, instead of asking for blueprints, we had asked for "user stories"?

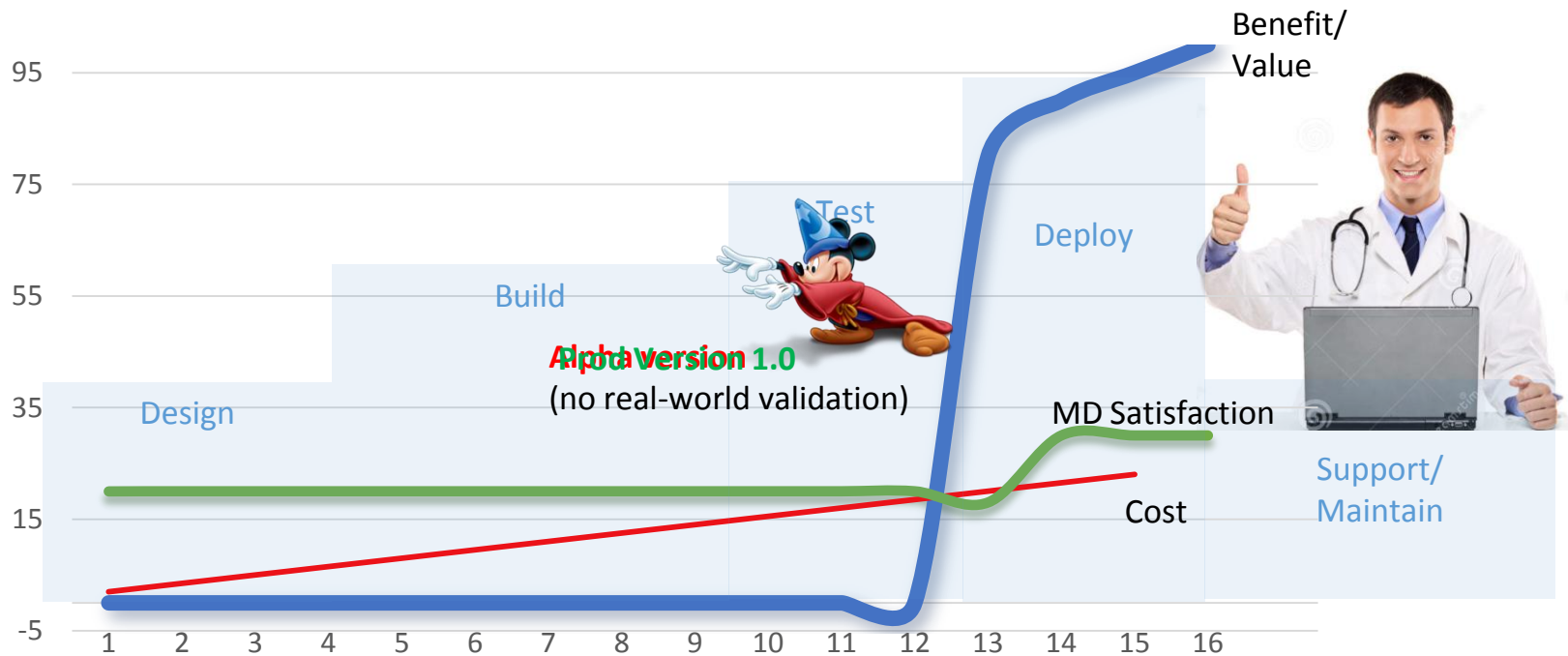User story: "A person in a wheelchair can park and access any floor in the building by elevator."

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Waterfall EMR design

Design/build team work

Technical focus

A->Z

- Clin Doc
- Surgery
- Ordersets
- Lab
- Imaging
- Pharmacy
- HIM
- Charge capture
- Supply chain
- Interfaces
- Devices

Gather requirements → Create IPP → Write specs → Build → Test → User validation → Learning curriculum → Deploy

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Idealized waterfall design

Idealized waterfall design

Benefit/
Value

95

75

Test

Deploy

Build

55

Alpha Version 1.0
(no real-world validation)

35

Design

MD Satisfaction
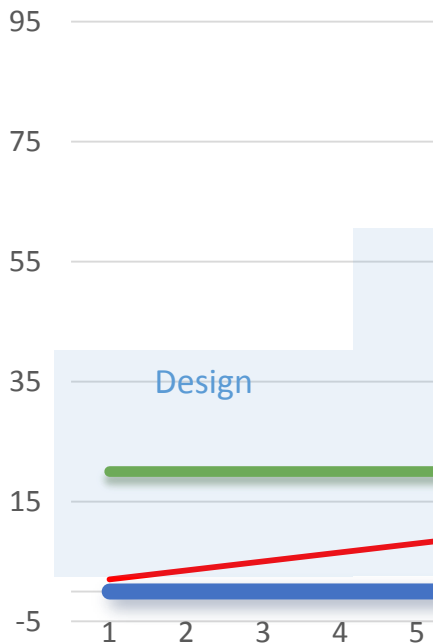
Support/
Maintain

15

Cost

-5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

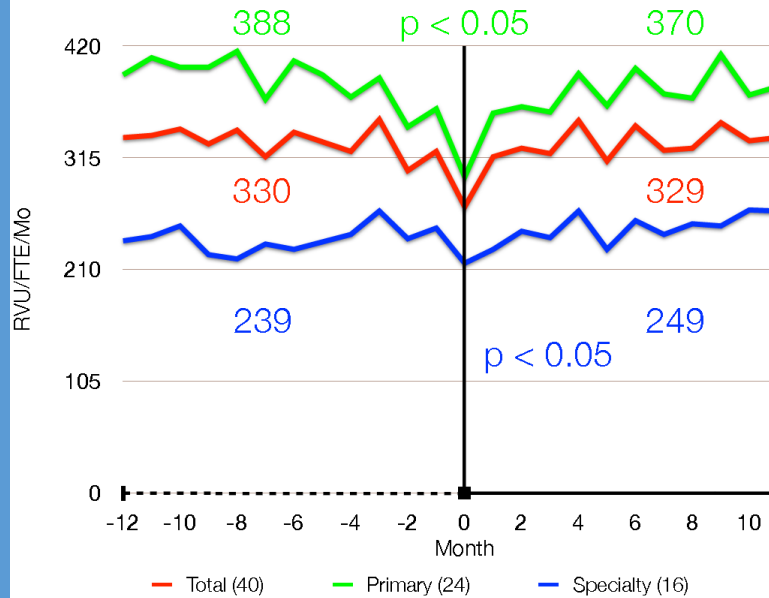# Real world waterfall design
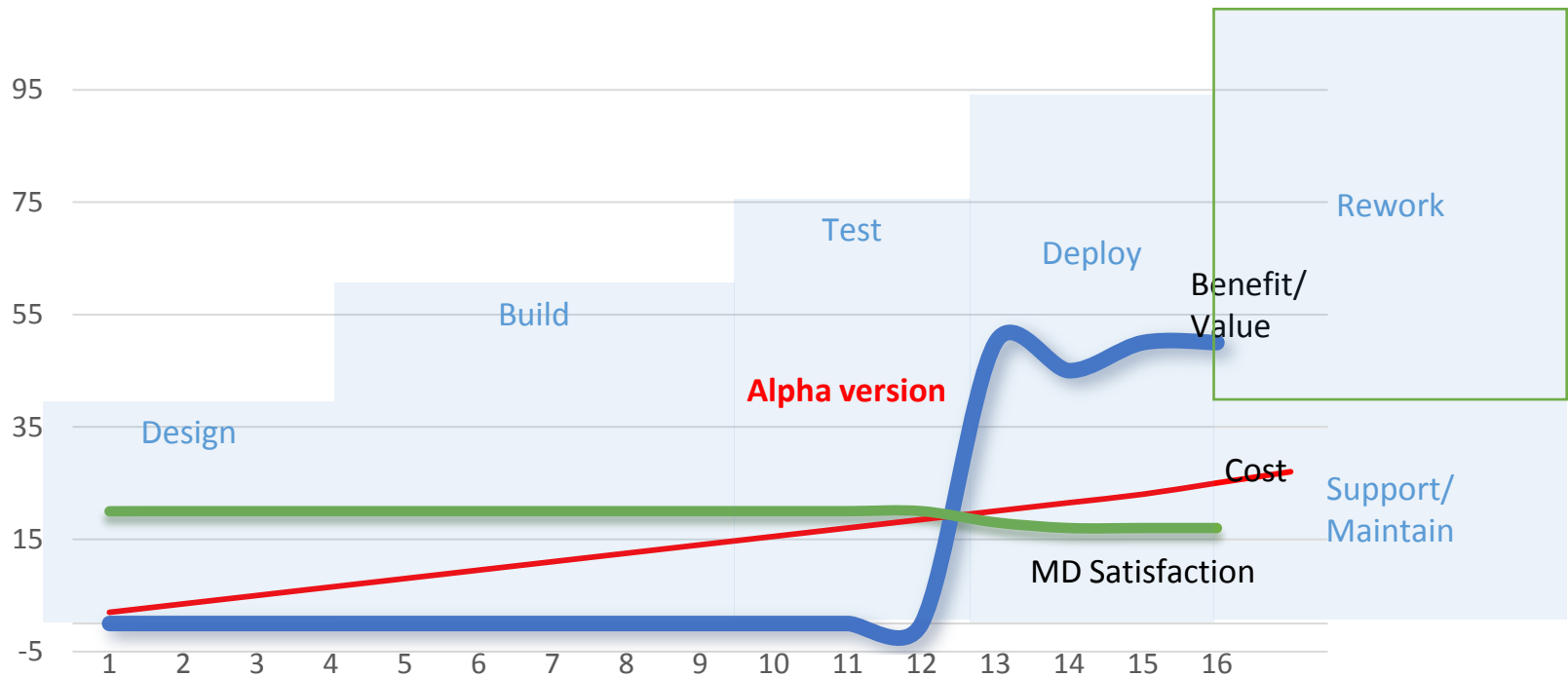
Real world waterfall design

Impact of ambulatory CPOE go-live on MD Productivity

388    $p < 0.05$ 370

330   329

239   249
$p < 0.05$

Total (40)   Primary (24)   Specialty (16)

2014, courtesy of Tony Yen, MD, CMIO EverGreen Health, Kirkland, Washington

Design

Rework

Support/ Maintain

What is Lean, agile?

Lean   **Agile**

- Value focused
- Iterative
- Empirical – success is *measured*
- Inspect, adapt, constantly improve
- Transparent
- Time obsessed

- Process improvement

- Eliminate waste, prevent defects
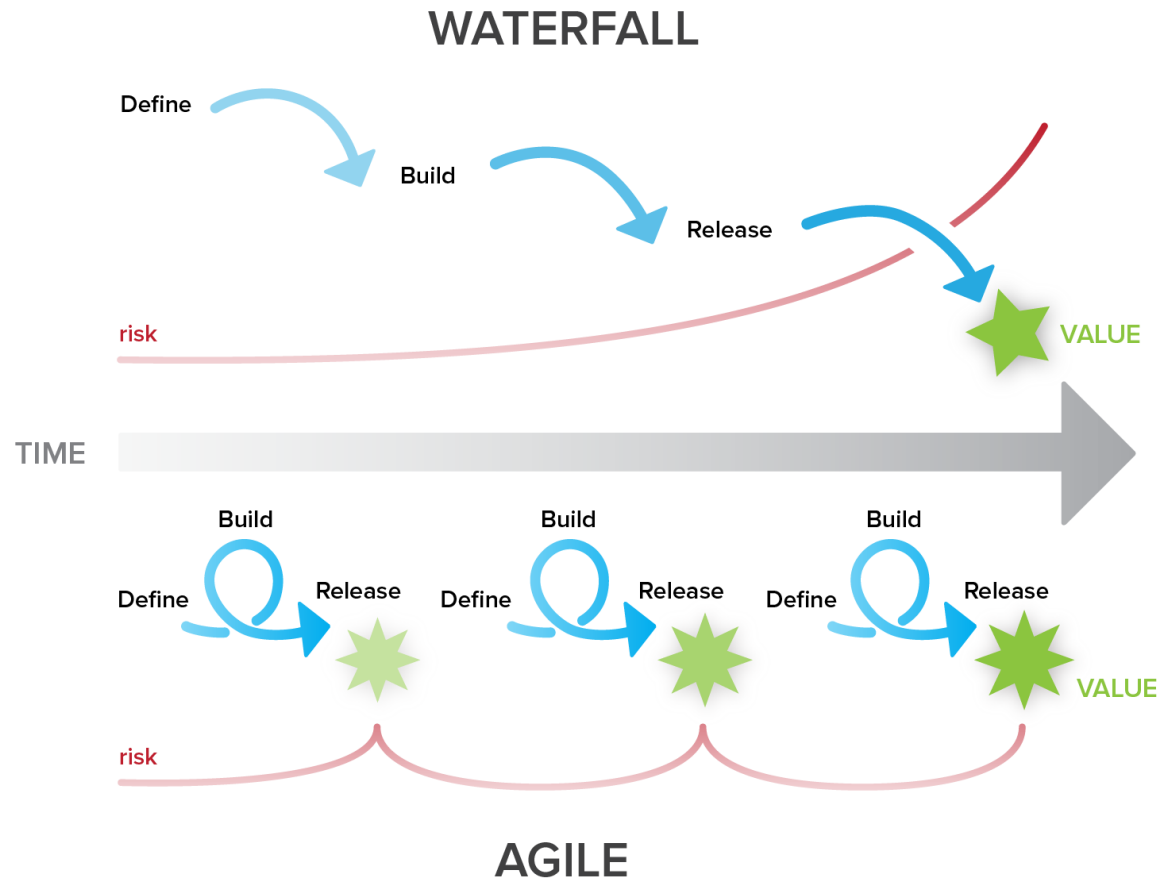
- Value stream maps

- Standard work for groups

- Product development/ Project management

- Constantly prioritize tasks. plan, plan, plan

- User stories

- Small team development

- Time boxed

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Agile aims to….

- Produce the *right* product on time

- Constantly **Inspect** and **Adapt**

- Don't just work, deliver ***value***

- **Demonstrate** the product as it is being built

- **Prioritization** is built in to every step

- Teams, not projects are "agile"
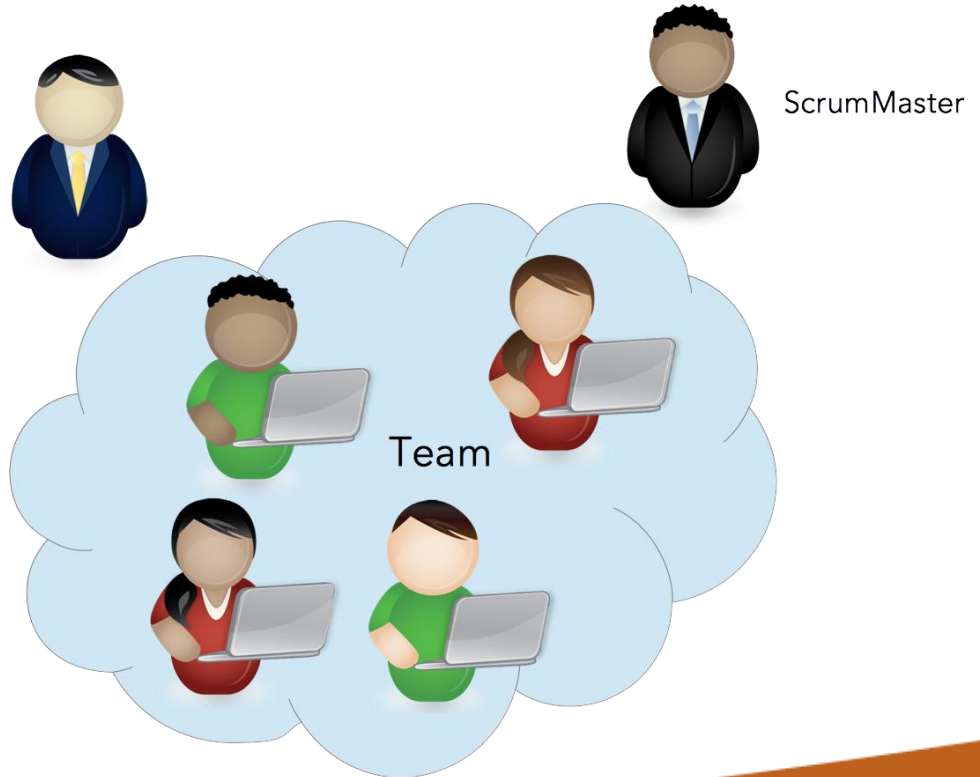
- People in a team are accountable to one another

WATERFALL

Define → Build → Release → VALUE

risk

TIME

Build / Define / Release → VALUE

risk

AGILE

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Agile (Scrum) Team Roles

Product Owner

ScrumMaster

Team

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What is a product owner?

Responsible for the product success

Has a vision of where to take the product

Cares about the user needs & the biz goals

Product Owner

project, and functions as a [...] stakeholders.

[...]ups,

CST has "Internal Product own[...]
"External Product Owners"

ScrumMaster

A joint initiative of VCH, PHSA, and PHC

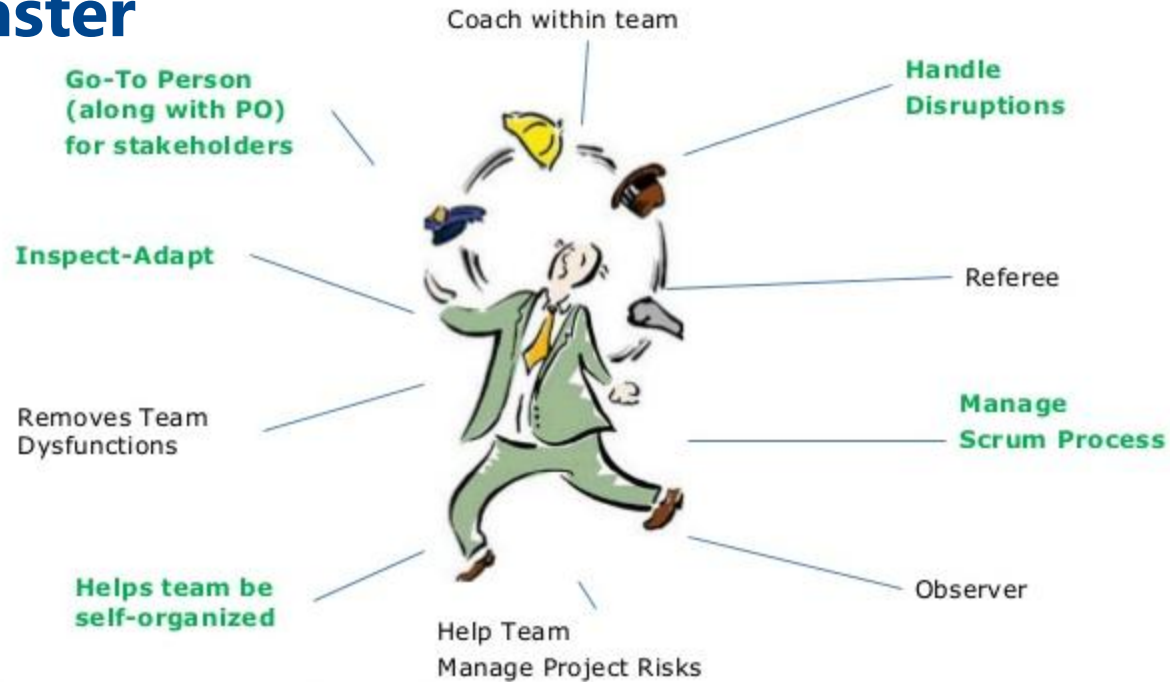CLINICAL + SYSTEMS
TRANSFORMATION
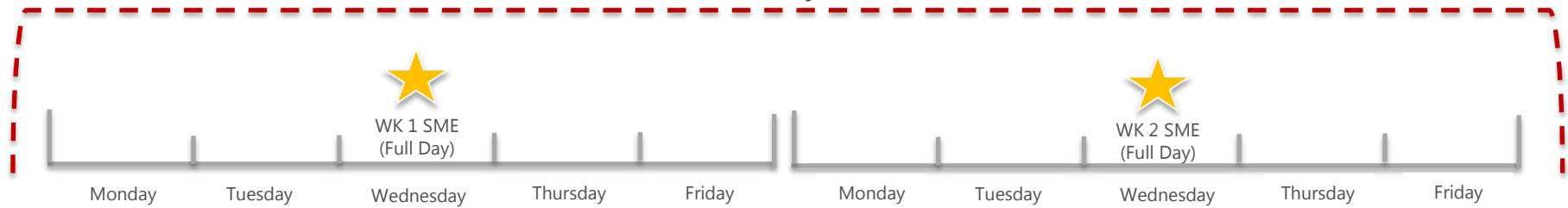Our path to smarter, seamless care

What is a scrum master

The scrum master is the facilitator and executive assistant for the team.

Primary duties:

Remove road blocks
Lead daily standup
Facilitate discussions/ stop swirl
Lead retrospective

Coach within team
Go-To Person (along with PO) for stakeholders
Handle Disruptions
Inspect-Adapt
Referee
Removes Team Dysfunctions
Manage Scrum Process
Helps team be self-organized
Observer
Help Team Manage Project Risks

Scrum master on the ED team

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		WK 1 SME (Full Day)					WK 2 SME (Full Day)		
Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday

MONDAY:
- Project leader Team Rounds (between 9 a.m. and 11 a.m.) – provide updates
- Complete Sprint Planning (stared on Thursday and Friday of last week) with Cerner Consultants

TUESDAY
AM = Continue Sprint Planning
PM = Meet with Product Owner to review topics and planning

WEDNESDAY: SME Session Week #1:
20% 'seeing', 80% 'doing'

- Report Out (1 hour) – Skype Broadcast, 20 minute demo and Q&A Session (all SMEs + Stakeholders)**

THURSDAY:
- Update Backlog based on User Story Workshop
- Develop/send configuration packages to teams

FRIDAY:
- Review of Configuration as it is completed
- Daily check in with Product Owner
- **Update Workflow

MONDAY:
- Review of Configuration as it is completed
- Daily check in with Product Owner

TUESDAY:
- Review of Configuration as it is completed
- Daily check in with Product Owner

WEDNESDAY: SME Session Week #2:
AM = Final Preparations for Validation Session
PM = Review/Validate the Future State Workflow in Cerner
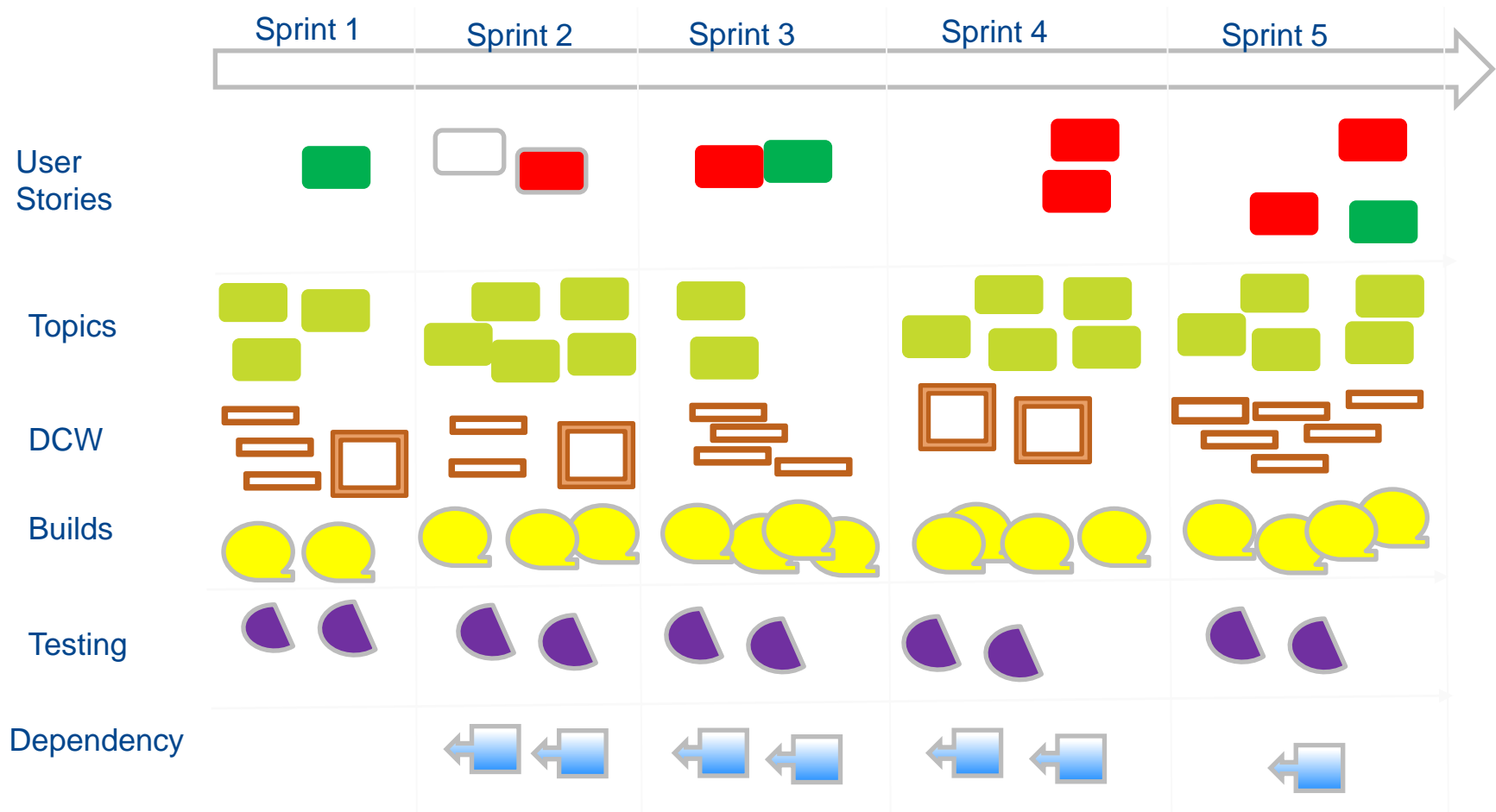- Skype Broadcasts to stakeholders – open to all

THURSDAY:
- Update test scripts with changes
- Sprint Planning (Pull topics from Design Session Plan)
- Initial planning for next sprint

FRIDAY:
- **Retrospective ***
- Continued planning for next Sprint
- Compile a short video of functionality for Stakeholders

Sprint Planning for Releasable Increment of Product
(Rinse and Repeat Two Releases ahead)

Daily stand-up

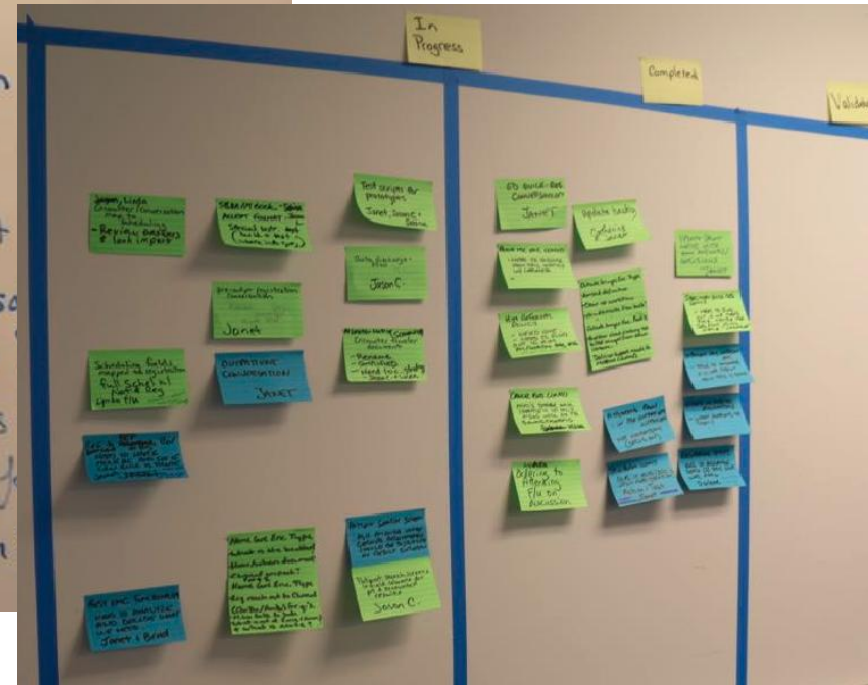**Occurs every morning, and is facilitated by the scrum master …**

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Daily stand-up

Each team member reports:

What I accomplished yesterday …

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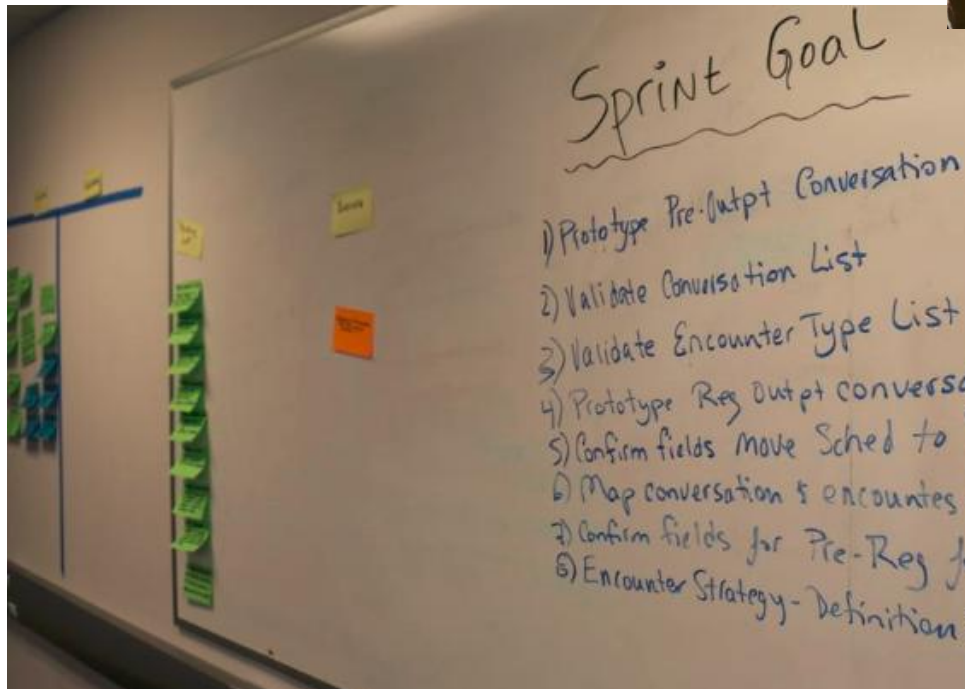
Daily stand-up

What I am working on today…

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Daily stand-up

What I need help with ….

**** And what is blocking my progress**

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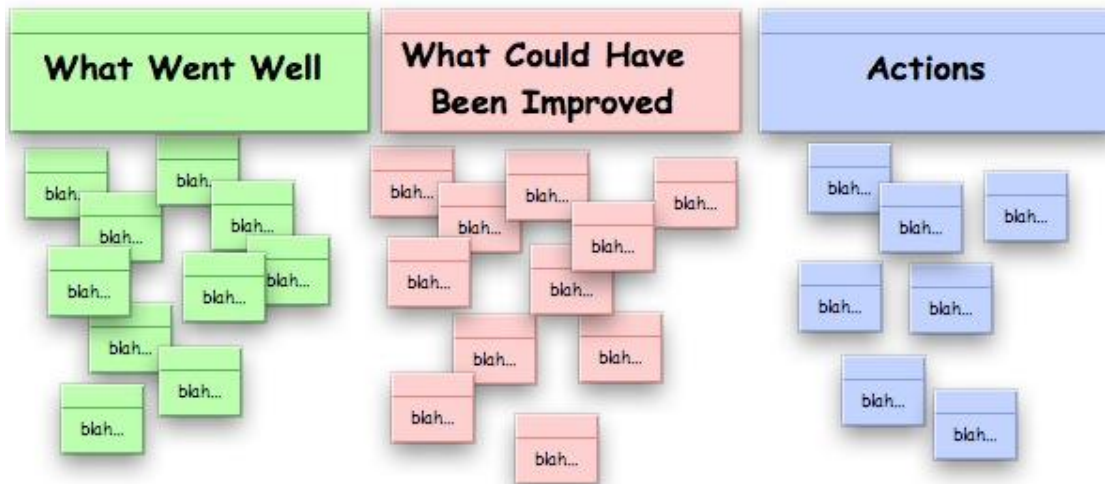Our path to smarter, seamless care

Retrospective

At the end of each sprint, the team holds a retrospective meeting led by the scrum master.

This is a closed-door meeting and the team members are encouraged to openly reflect on how their own work, and that of the team could improve.

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Waterfall implementation

what we are **not** doing

Site 1 go-live

Site 2 go-live

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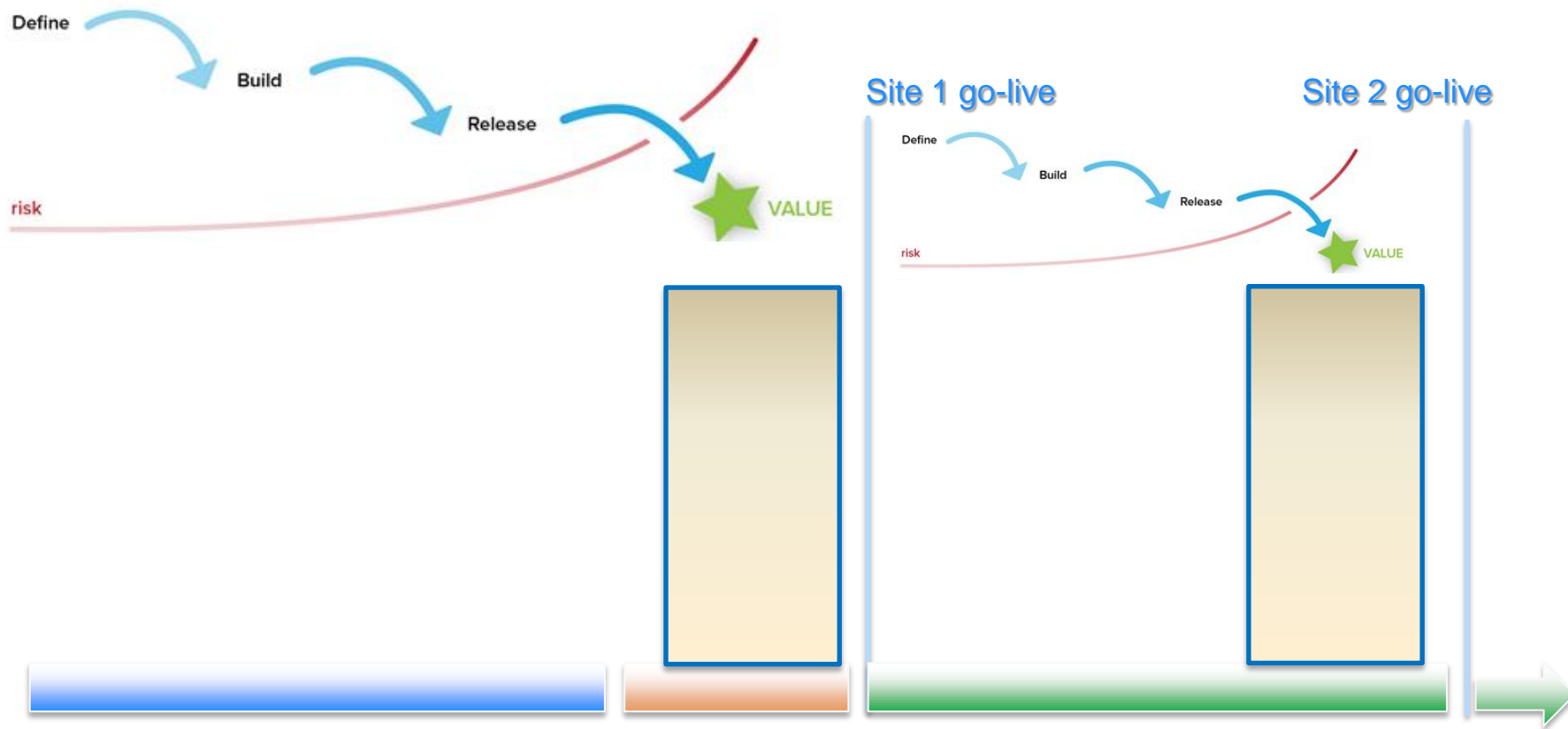
Release

Incremental build around patient journeys

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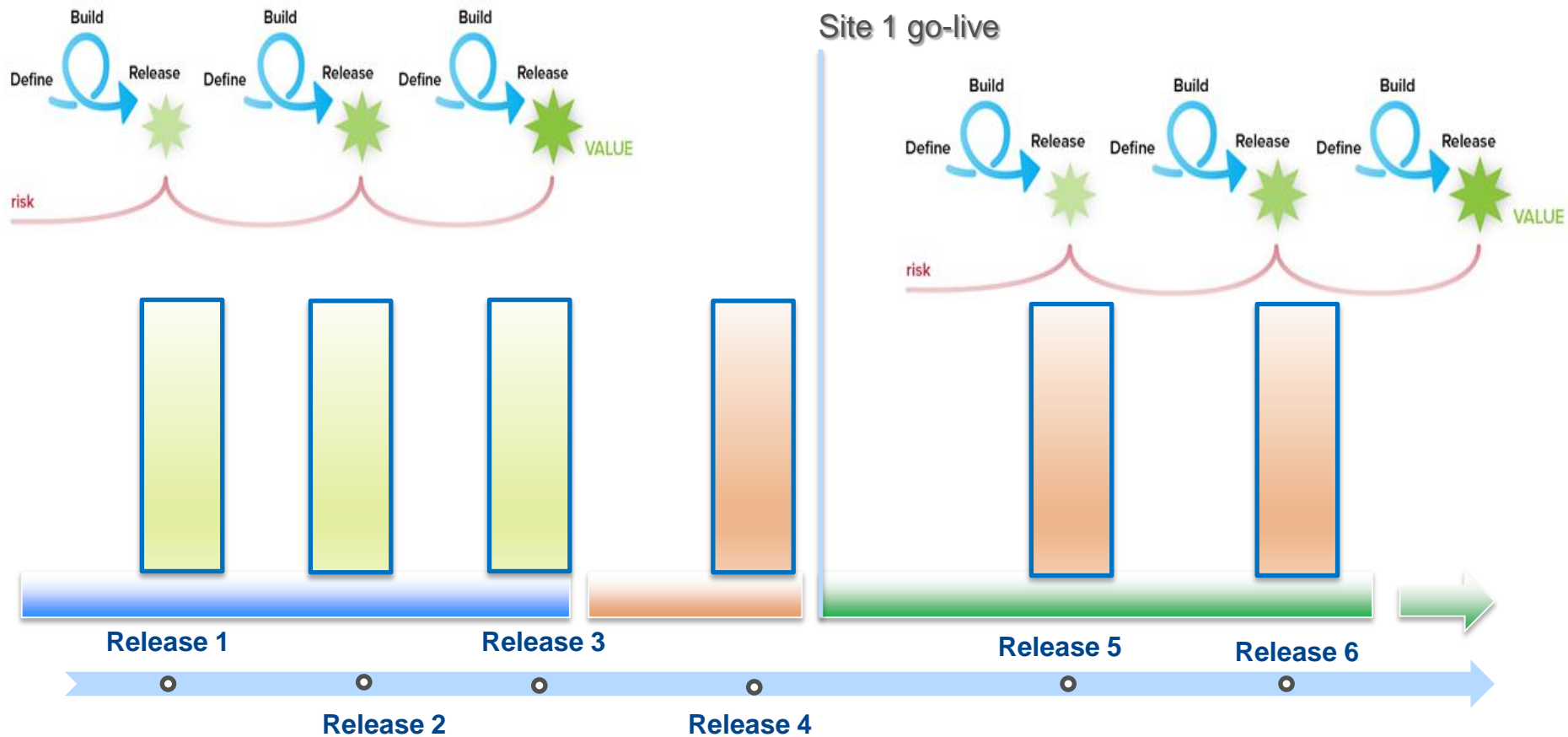
PATIENT STORY 1 – RELEASE 1

Sally Test, 65 year old woman presents to Lions Gate Emergency with:

* shortness of breath, chest pain and fever.

The patient is:

* triaged,

* registered,

* problem/diagnosis and allergies documented and

* initial vital signs taken which show her to be hypotensive, febrile and mildly hypoxic.

* ECG obtained as per chest pain protocol

MD assesses the patient and is assigned on the status board.

MD reviews ECG, which is negative

MD enters initial orders for:

* Lab Tests,

* XR of chest (for possible pneumonia)

* Start IV fluids to address hypotension …. .

Presentation → Triage → Registration → MD assessment → Diagnosis → Admission → Inpatient management → Discharge

PATIENT STORY 2 – RELEASE 1

Gravida Check, 37 years old, presents at 39 weeks 5 days for intermittent abdominal pain and leakage of fluid

- Patient is seen in the Labour and Delivery triage area by RN and Midwife (RM)

- Patient is registered and is moved to the assessment area

- RN initiated orders are started

- Patient is assessed by RN and RM

- RM places orders to admit the patient

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Waterfall EMR design

Design/build team work

Technical focus

A->Z

- Clin Doc
- Surgery
- Ordersets
- Lab
- Imaging
- Pharmacy
- HIM
- Charge capture
- Supply chain
- Interfaces
- Devices

| Gather requirements | Create IPP | Write specs | Build | Test | User validation | Learning curriculum | Deploy |

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Agile EMR design

Technical focus

Design/build team work

■ Clin Doc	■ Surgery	■ Ordersets	■ Lab
■ Imaging	■ Pharmacy	■ HIM	■ Charge capture
■ Supply chain	■ Interfaces	■ Devices	

Patient Journey

Triage → Registration → RN assessment → RN document-ation → MD orders → RN Treatment → Rad test done → MD result review → ....

CLINICAL + SYSTEMS TRANSFORMATION
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Agile EMR design

Design/build team work

Clinical focus

Clin Doc	Surgery	Ordersets	Lab
Imaging	Pharmacy	HIM	Charge capture
Supply chain	Interfaces	Devices	

Patient Journey

Triage	Registration	RN assessment	RN document-ation	MD orders	RN Treatment	Rad test done	MD result review	....

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Release #2

Maternity patient with C-Section gets Surgical site infection – leading to sepsis

- Early Warning Signs
- Critical care outreach Team
- Cardiac arrest - Code blue on ward
- Documentation during and post code
- Patient transfer to ICU
- Med rec - transfer
- Mechanic ventilation
- Inotropes
- CRRT
- ECMO
- ABGs – POCT and Lab – orders out and results
- IPOCs
- Rounds
- Transport back to unit
- Handover – SBAR and ICU patient summary

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Clinical Transformation Workshop

- ½ day sessions involving clinical staff

- Focus on real patient scenarios

- Hands on validation of system prototype & workflows in a clinical setting vs conceptual design in a meeting room

- Integrated cross team review of the Enterprise workflow through a clinical process and specialities – care pathways

- Feedback incorporated by the design team to improve prototype & workflow

- Addition of clinical and business details into workflows to support frontline clinicians understanding of new processes

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Risks and challenges

- Lean and agile are ideologies and systems, not methodologies.

    - You can't "*do* a little Lean". … Projects don't *do* agile, Teams *are* agile.

- It is challenging to blend lean and agile with traditional top-down management or waterfall project planning

- Faux lean and agile is less effective than traditional methods

- Change management/ cultural change

- New to health care IT (and your vendor is unlikely to understand it)

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Discussion