Readmission Analytics:
Care Transformation through Innovation and Analytics

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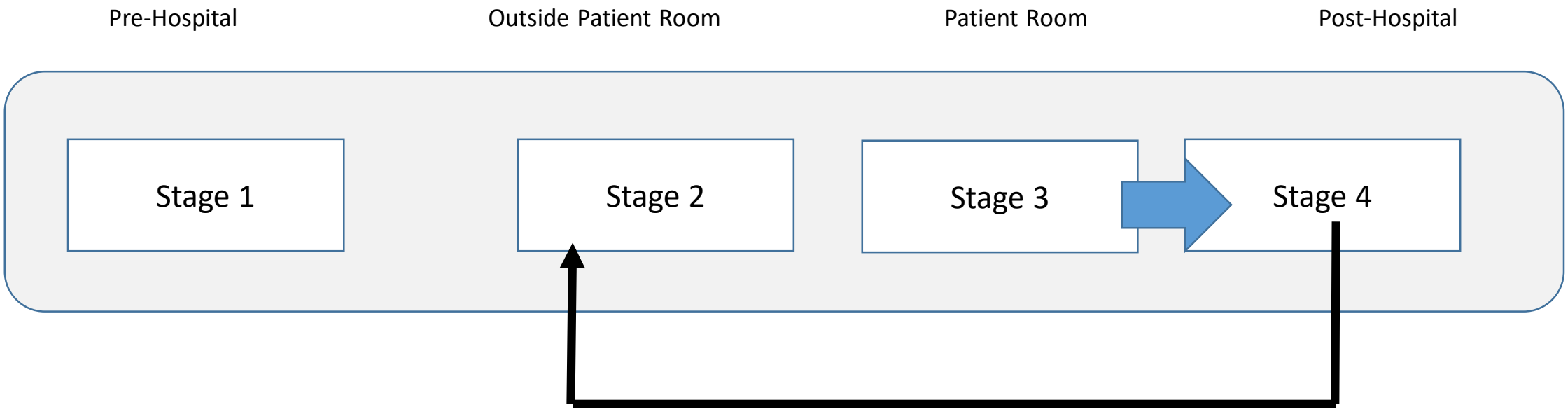
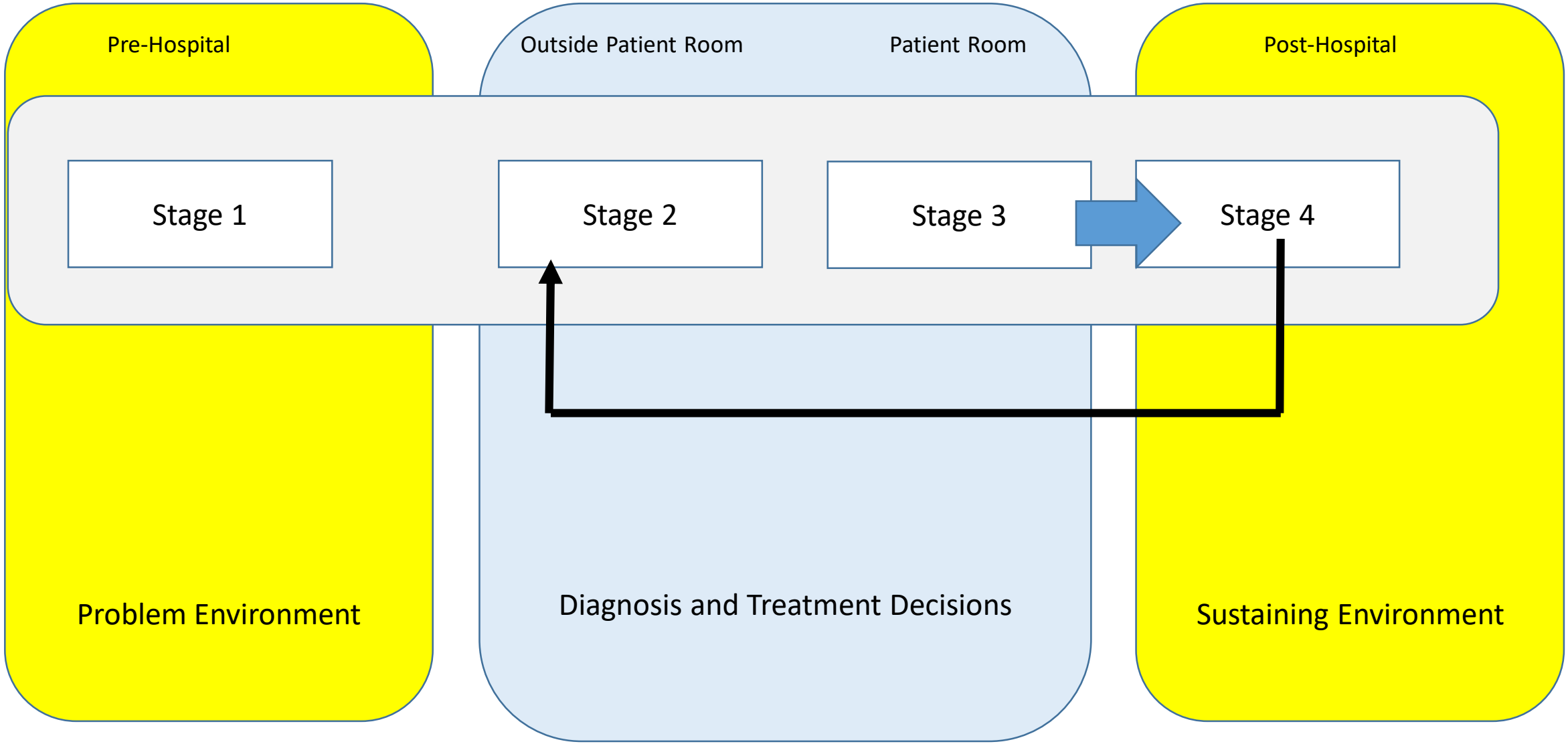
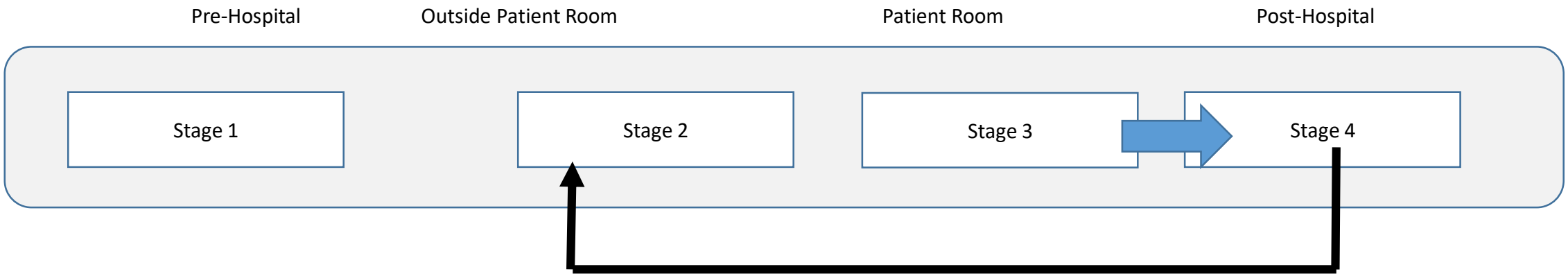
Care Stages and Readmission
- Focus is on Continuity of Care



Patient Care Life Cycle & Readmission

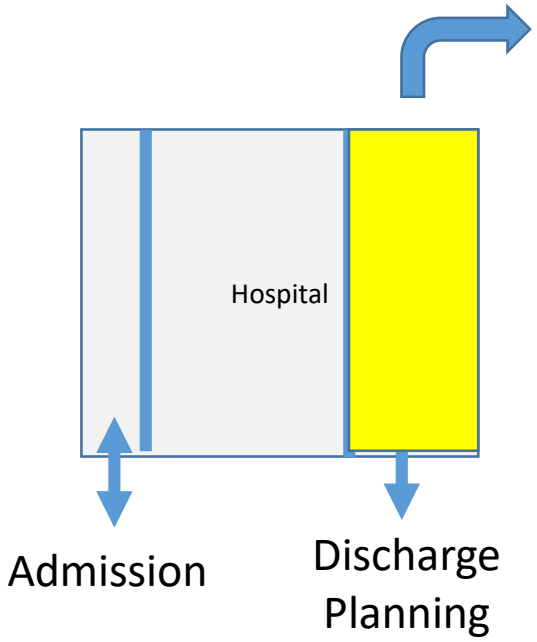


Continuity of Care - Looking through readmission lens



- Innovations to
  - Improve care outside the hospital
  - Improve care within the hospital to reduce readmission
  - Reduce the need for admission in the first place

Ideal Discharge Planning[1]

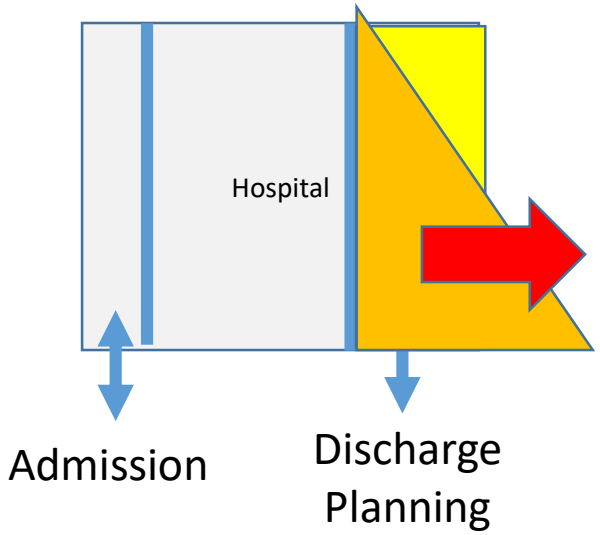


Discharge planning

1. Complete communication of information
2. Medication safety
3. Educating patients to promote self-management
4. Enlist help of social and community supports
5. Advance care planning
6. Coordinating care among team members
7. Monitoring and managing symptoms after discharge
8 Outpatient follow-up

[1] Burke R.E., Kripalani, S., Vasileksis, EE., et al., "Moving beyond readmission penalties: creating an ideal process to improve transitional care," J. of Hospital Medicine, 2013, Vol.8, pp: 102-109

Subtraction & Task Unification



Subtraction

Task Unification
(Subtraction form one system and add to another system)

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- Innovations that
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  - Encourage patients to self-manage their care post-discharge
  - Shift some post-discharge responsibilities to inside the hospital

Study 1: Ascension/Crittenton – Nursing Home

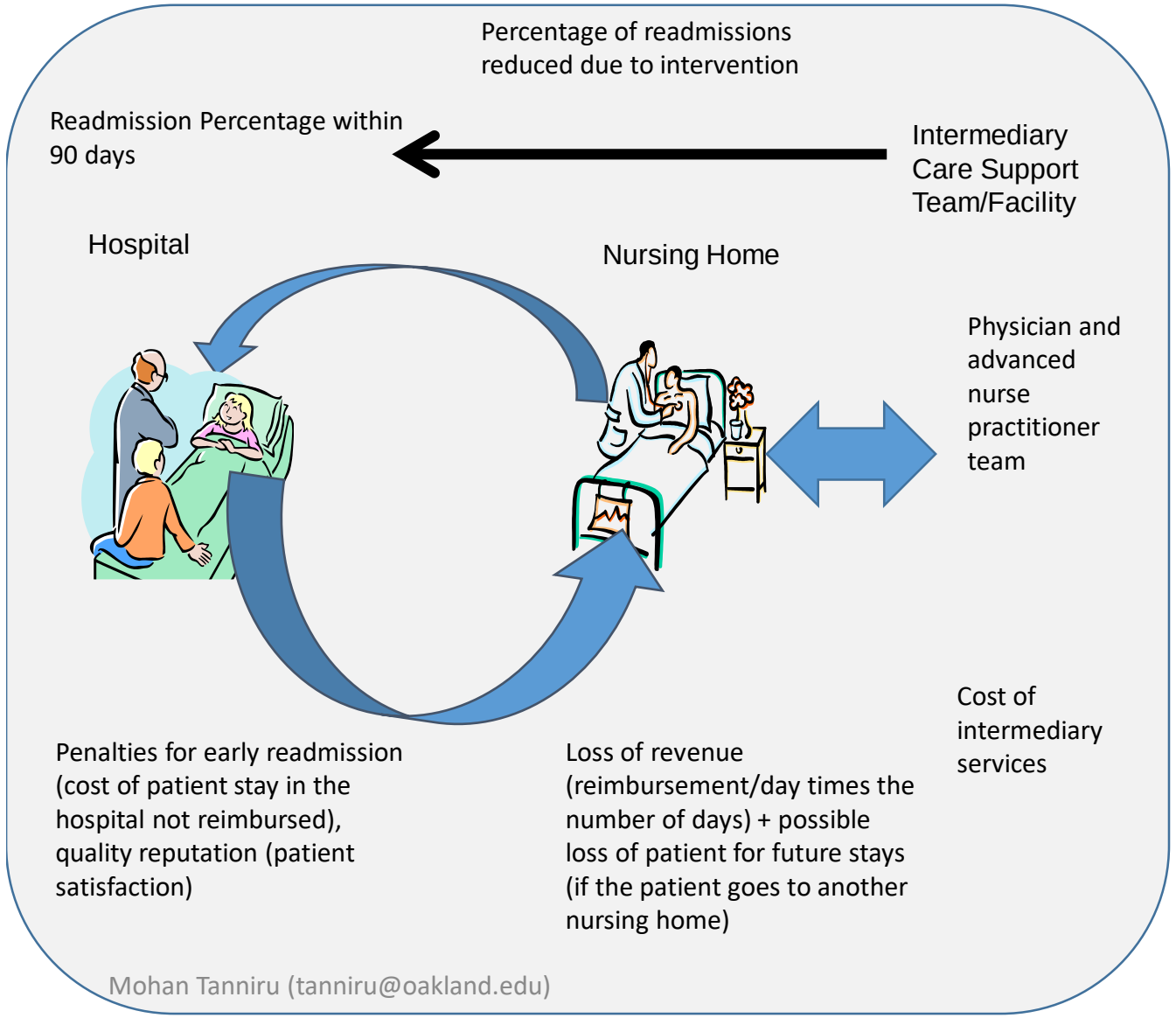
Study 2: St Joseph Mercy – RSVP

Study 3: Henry Ford HS – Postal workers (based on a UK model)

Study 4: Infomediary – health exchanges for knowledge sharing

Study 1: Role of Intermediaries at Nursing Homes

While CMS is supporting the effort now, one needs incentive models for hospitals, SNFs or insurance companies to support the role of the intermediary

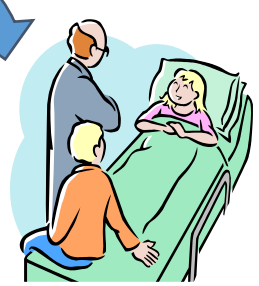


Study 2: Role of an intermediary at home (study on-going)

EMTs (emergency mgmt. technicians) visiting patients at home

Home

Hospital



Penalties for early readmission (cost of patient stay in the hospital not reimbursed), quality reputation (patient satisfaction)

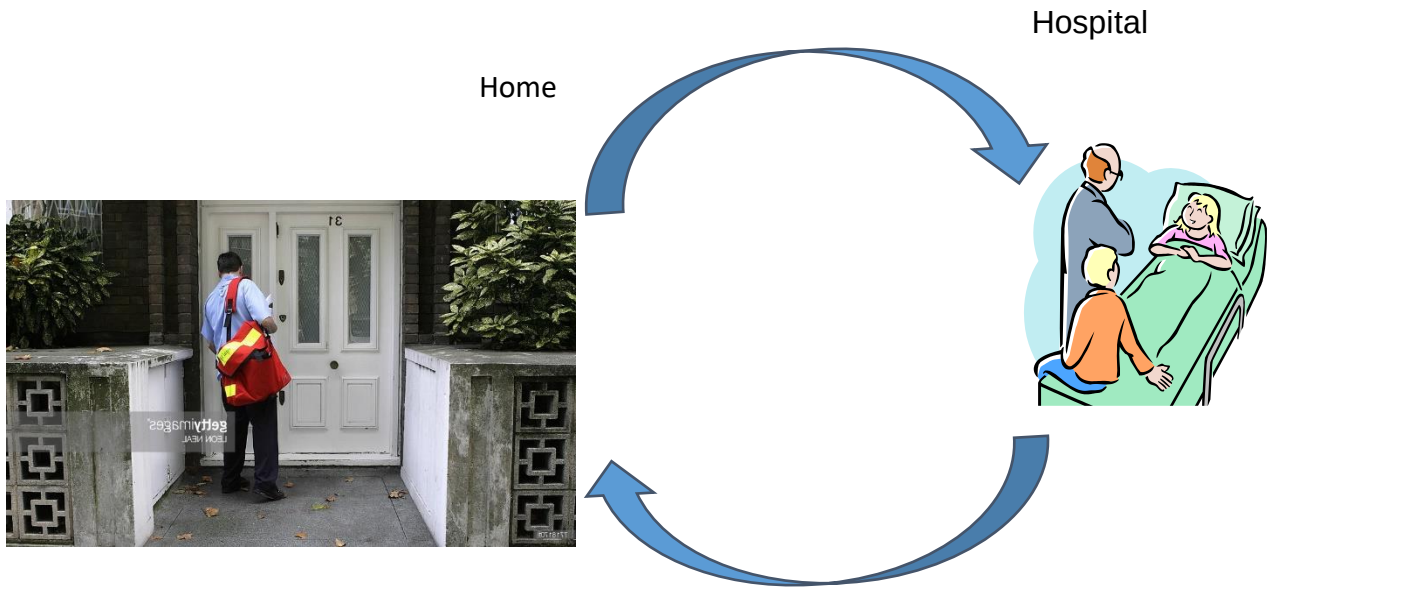
Select patients were given a wrist monitoring device to track vital signs

Provide an iPAD connected to hospital to enter certain information like weights

EMTs visit at some regular intervals to check on patient conditions

Hospital is paying for the time EMTs spend and is exploring viability of this option in the long run for potential expansion

Study 3: Role of an intermediary at home (study in pilot phase)



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Knock and Check

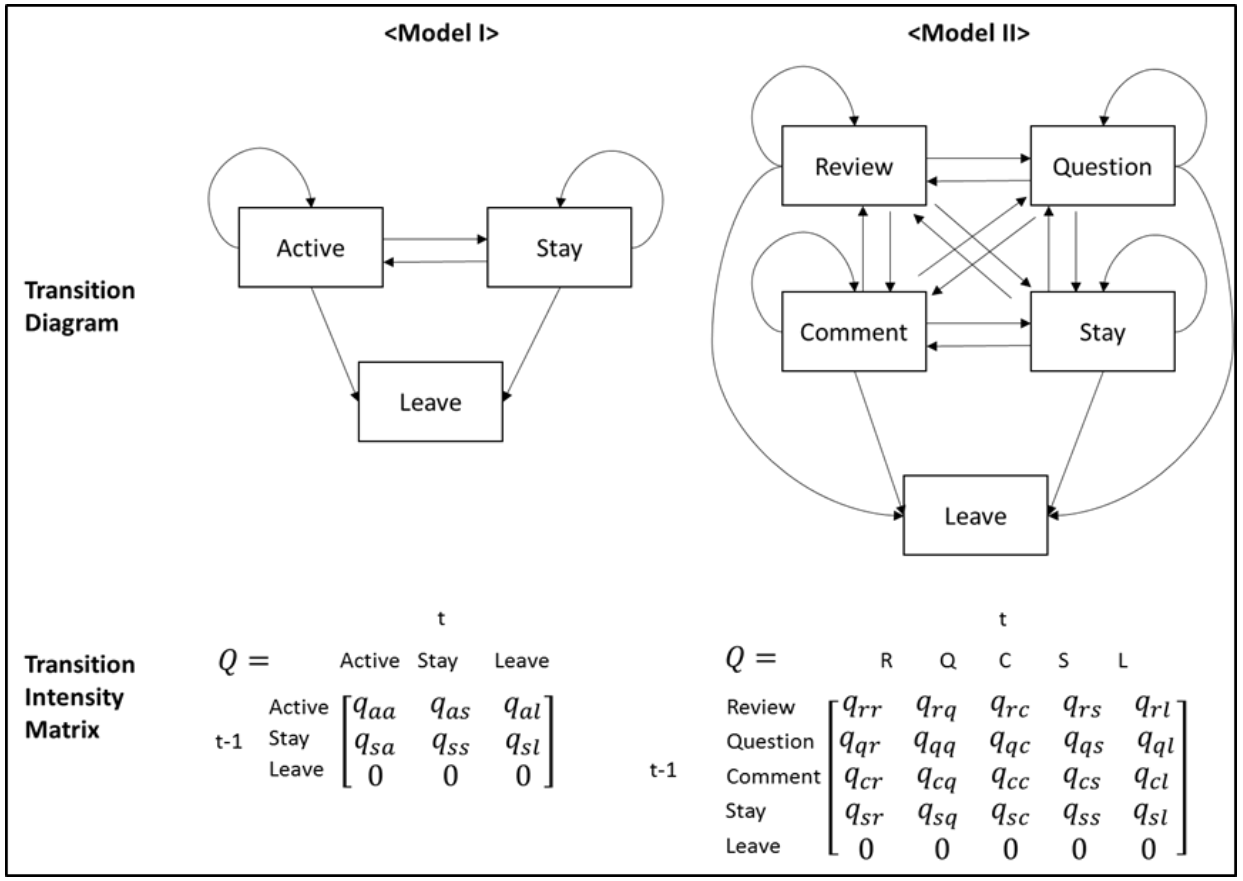
Fashioned after Call and Check of UK

Letter carriers visit the homes of frail seniors, who live along their route, to check on their well-being. Led by Henry Ford Global Health, Knock & Check hopes to partner with the post office to conduct these visits

Utilizing existing workforce capacity (like letter carriers) to conduct short in-person weekly visits with frail seniors is an exciting innovation with the potential to reduce isolation and improve health.

Study 4: Infomediary to Support Knowledge Sharing

- **Active users are two times more likely to stay than leave in the short term**. Activity keeps users engaged for a short time span, but it may not sustain their engagement with the infomediary over time. Need intervention to keep them engaged
- **Non-active users maintain a status-quo in short run and gradually move to the "leave" state** from the infomediary in the 8 weeks' period.
- **"Questioning" activity leads to the highest probability that a user will stay engaged** both in the short and long run.
- Furthermore, **users seeking information on diverse and multiple numbers of topics have a higher propensity to stay** than users asking questions around a single theme



Khuntia, J., Yim, D., Tanniru, M., and Lim, S. "Patient Empowerment and Engagement with a Health Infomediary," Health Policy and Technology, Available Online Prior to Print: http://dx.doi.org/10.1016/j.hlpt.2016.11.003

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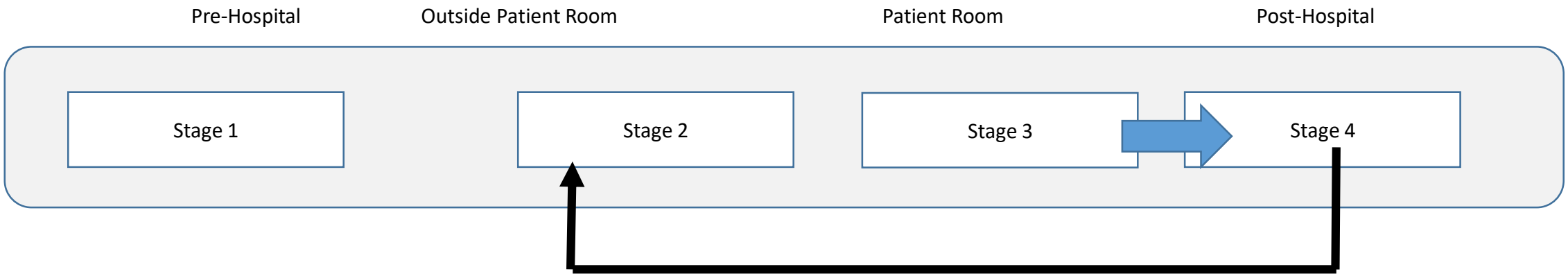

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  - Analyzing team-work in operating rooms
  - Analyzing patient flow analysis in ER

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Study 5: St Joseph Mercy - Intelligent Care Systems
Escalation protocols
Digital services to reduce fall risk, hospital acquired infections, and glycemic control
Getwell networks
Inter-professional rounding
Risk based proactive nurse engagement

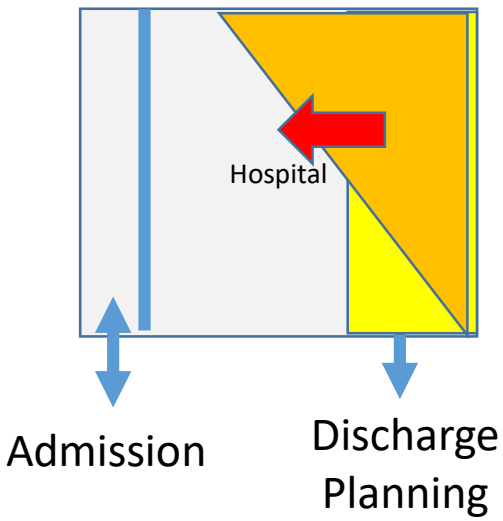
Study 6: U of Vermont/Stanford – Operating room

Study 7: St Joseph Mercy – ER

Study 8: CHIP and other innovations

Division

- Reordering processes as a part of pre-medical care and use pharmacists in support of this effort - Medication Reconciliation (Inter-professional rounding)
- Waiting time, often considered wasteful and stressful, can be utilized for education; Patient and Family education early to pre-discharge (GetWell Network)
- Improve patient stratification for discharge service customization (e.g. select patients with acute care conditions (e.g. broken hip, leg fracture, etc.) – Smart Beds, Segmented Patient Calls, Proactive follow-up with Fall Risk Patients



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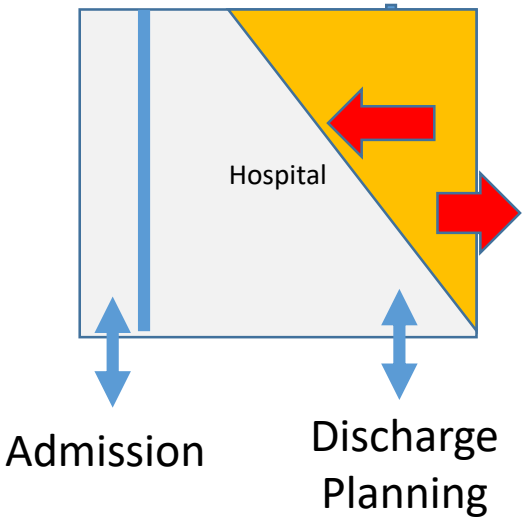
Multiplication

Categorize patients by risk and use advance care planning and enlisting of external social and community support

Partner with specialty clinics to handle unique patients (cancer or cardio-vascular disease centers, mental illness or substance abuse rehabilitation centers, etc.)



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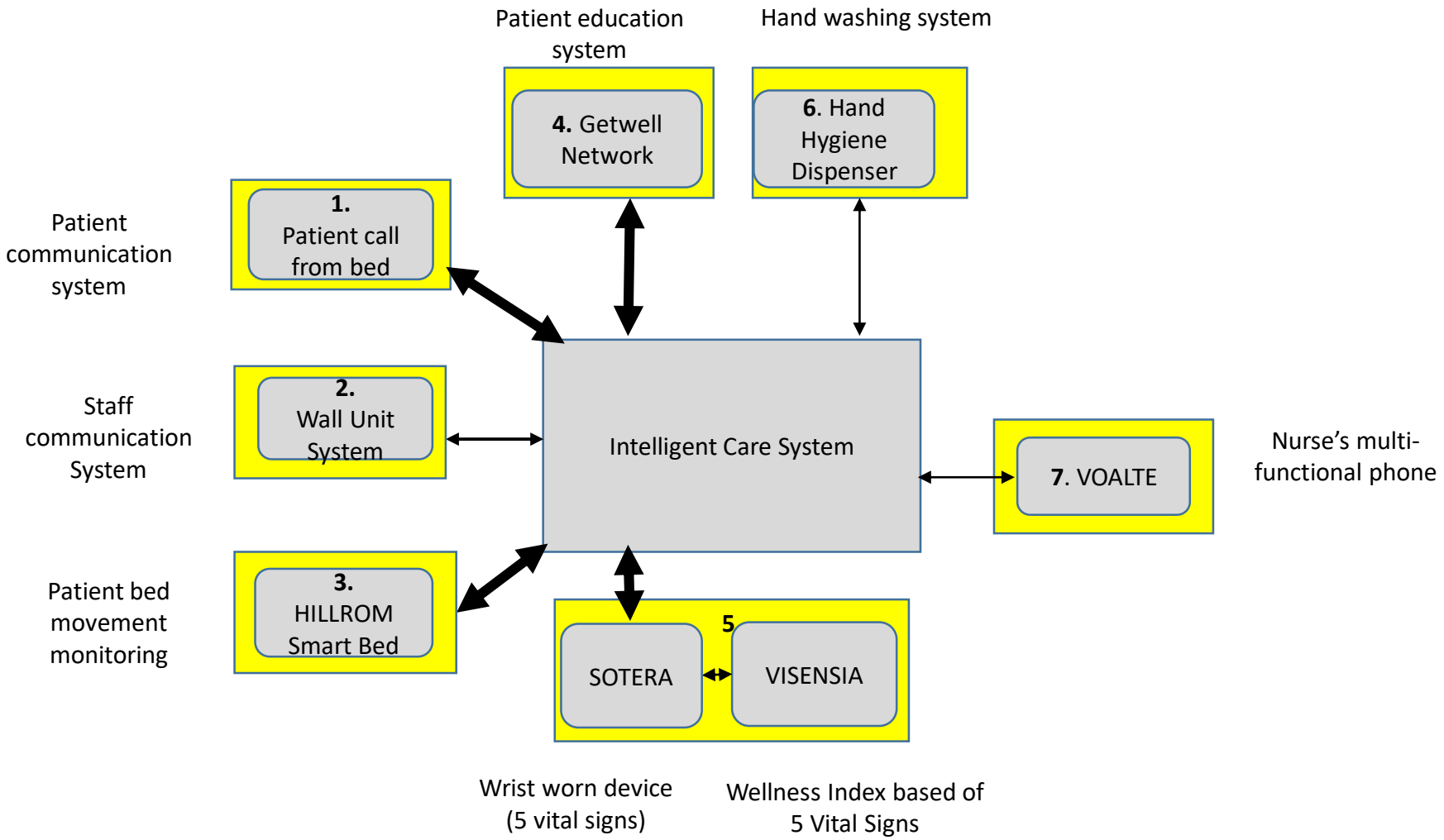
Innovations in Patient Room

SJMO – Intelligent Care System



Study 5.1 – Impact of Technology

- Patient Call System
  - Did it improve patient satisfaction?
    - Not as much as they hoped – compared patient satisfaction data with call response
    - Added inter-professional rounding using pharmacists, nurse and nurse manager, minister, etc. depending on situation - showed improvement in trends, but not significant
- Smart bed
  - Early reduction in risk not sustained
  - Added process innovation
    - nurses were asked to rank order the risk of patients and proactively visit them to take them to the bathroom - shown positive impact and is being scaled to other floors
- Alerts and Escalation protocols to improve patient response
  - Early analysis showed that the responses varied across floors
    - Based on nurses assessment of call urgency (e.g. surgical more than oncology)
  - Address stress on nurses due to too many alerts
    - Engaged in some process changes such as allocation of nurses to high risk patient

Study 5.1 – Impact of Technology

- Use of Hand Hygiene Dispenser to reduce hospital acquired infections
  - Early struggles in getting this adopted and not much improvement in HAI
  - Changed processes to create internal competition
  - Adjust the time interval for going through the “gel” dispenser
  - Improved HAI

Khuntia, J., M. Tanniru, F. Fragoli, and M. Nawrocki (2016), "Mindfulness Differences in Hospital Unit Operations: Analysis of Response to Nurse Call Systems," Pacific Asia Journal of Association of Information Systems, (PAJAIS), 8(1), 33-6

Khuntia J., M. Tanniru and J. Weiner (2015), "Juggling Digitization and Technostress: The Case of Alert Fatigues due to Intelligent Care System Implementation at a Hospital," Healthcare Policy and Technology, August, 29, Elsevier.

Study 5.2 - Patient Satisfaction in Hospitals (in general)

- On-going struggle as to what contributes to improvement in patient satisfaction
- Analyzed multiple ED patient data using both empirical and text mining of qualitative responses
  - Method itself is rather in-effective in measuring the true measures of satisfaction
  - Some factors are controllable and others outside the control of the hospital
- Developed quick surveys of patients in the hospital (patient experience)
  - Interesting results
  - Inter-professional rounding helped but not significant

Khuntia, J., M. Tanniru and J. Weiner, "Dimensions of Patient Experience and Overall Satisfaction in Emergency Units," 2017, Journal of Patient Satisfaction.

Varanasi, O. M. Tanniru, "Seeking Intelligence from Patient Experience using Text Mining - Analysis of Emergency Department Data," Information Systems Management, 2015, 32:1-9.

Study 5.3 - Hospital Leadership

- Alignment of Innovations in Patient Care and Hospital Metrics
  - Greater integration of data from multiple hospital units and their overall impact on local as well as hospital metrics
  - Change in the hospital culture is needed – data driven, transparent and accountability

Weiner, J., Tanniru, M., Khuntia, J., Bobryk, D., Naik, M., Page, K.L., (2016), Digital Leadership in Action in a Hospital through a Real Time Dashboard System Implementation and Experience, Journal of Hospital Administration, May, 2016

Weiner, J., V. Balijepally and M. Tanniru, "Integrating Strategic to Operational Decision-Making using Data-Driven Dashboard Implementation: The Case of St. Joseph Mercy Oakland Hospital," Journal of Healthcare Management, 2015, Vo. 60, No 5, Sept/Oct. pp: 319-331.

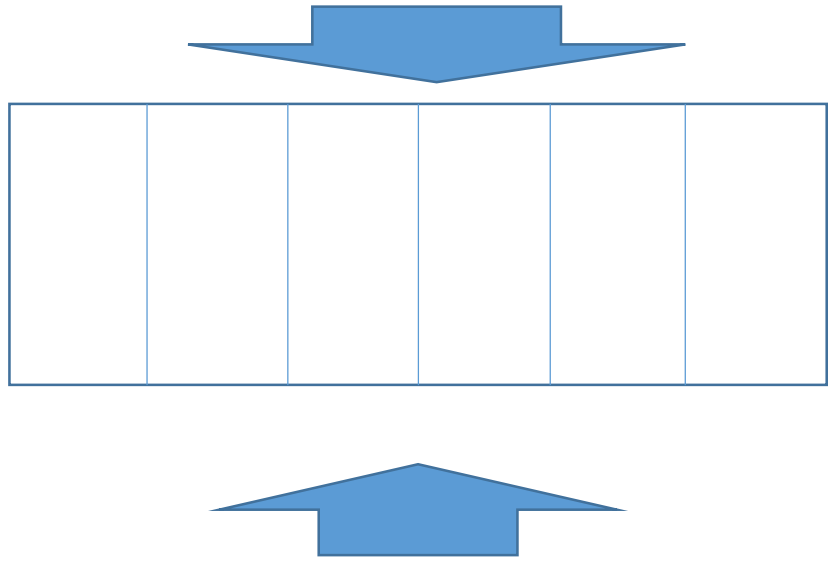
Boggs S.D, M.H. Tsai, M. Tanniru, "Will operating rooms run more efficiently when anesthesiologists get involved in management?" Forthcoming in a book titled, "You're Wrong, I'm Right: Dueling Authors Reexamine Classic Teachings in Anesthesia," edited by Corey Scher, Anna Clebone, Sanford Miller, and David Roccaforte, Springer, 2017

Study 6. - Innovations in OR - Optimization/Simulation

Past Data, Physician Preferences, Patient Surgical Admissions, etc.

Operating Room Schedule for next day

Changes during the day due to complications – uncertainty in resource planning



Operating Room Culture – Physician Centric
Surgeon's Reputation
Lack of Team Orientation
Resource Flexibility – Anesthesiologists, specialist, etc.

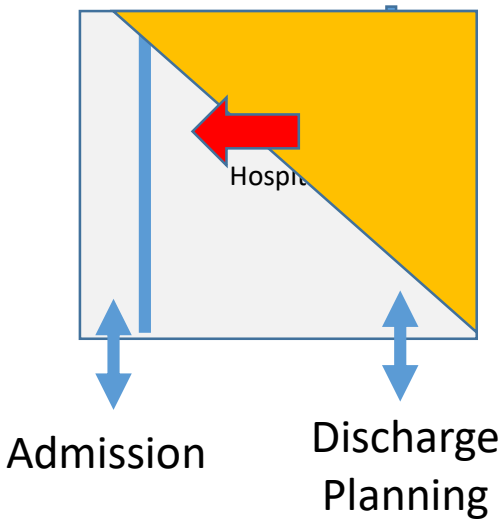
Move some surgeries to less expensive ambulatory care facilities – especially elective non-complex surgeries

Allow physicians blocks of rooms to trade among each other

Dynamic scheduling based on team (physician/nurse/anesthesiology) resource availability

- Monitoring symptoms and advance care planning by linking severity of patient diagnosis with timing of such disease occurrences.
- Focus on patients susceptible to flu, allergies, and sports related injuries, and especially those with certain chronic conditions

Attribute Dependency



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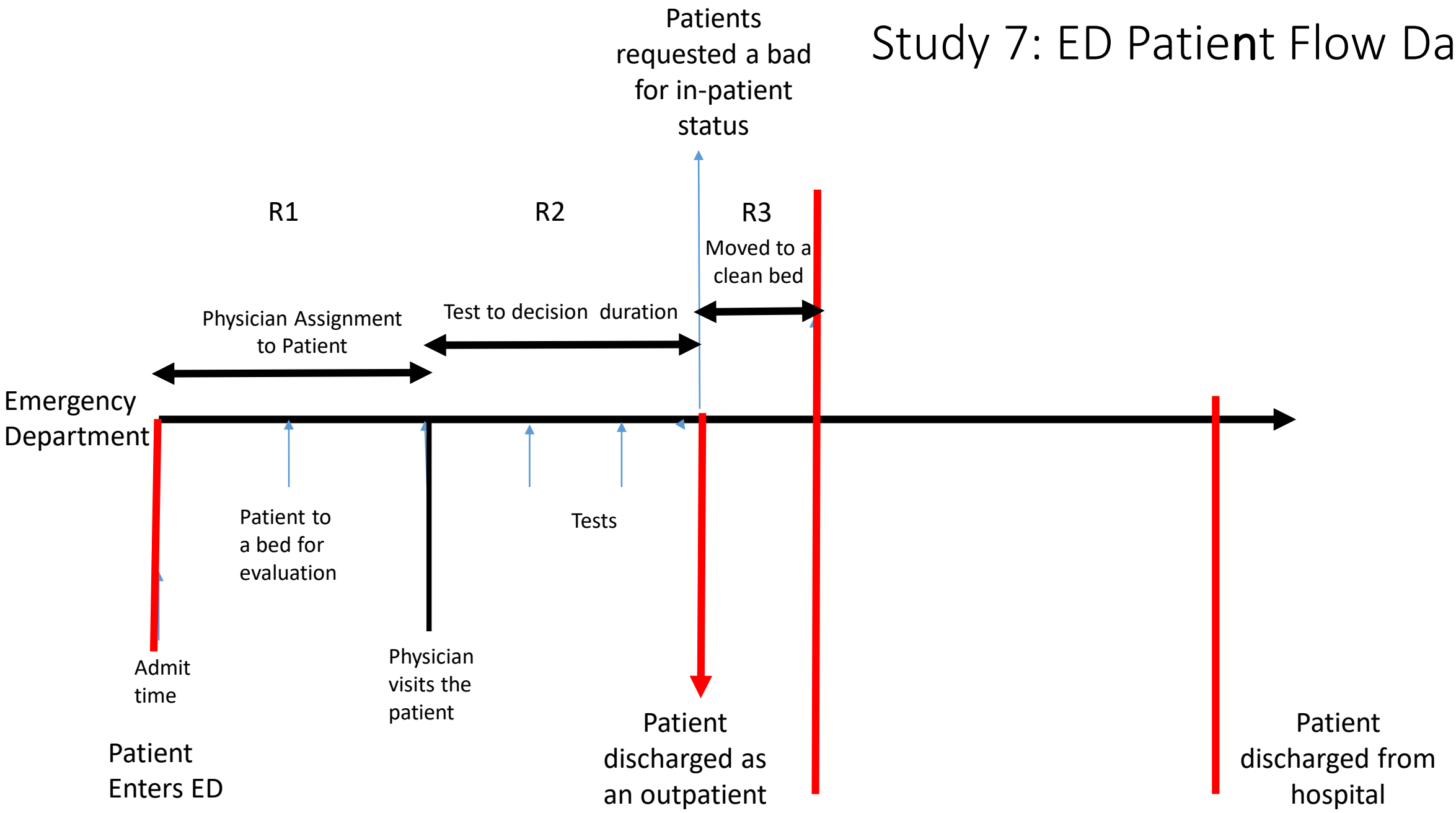
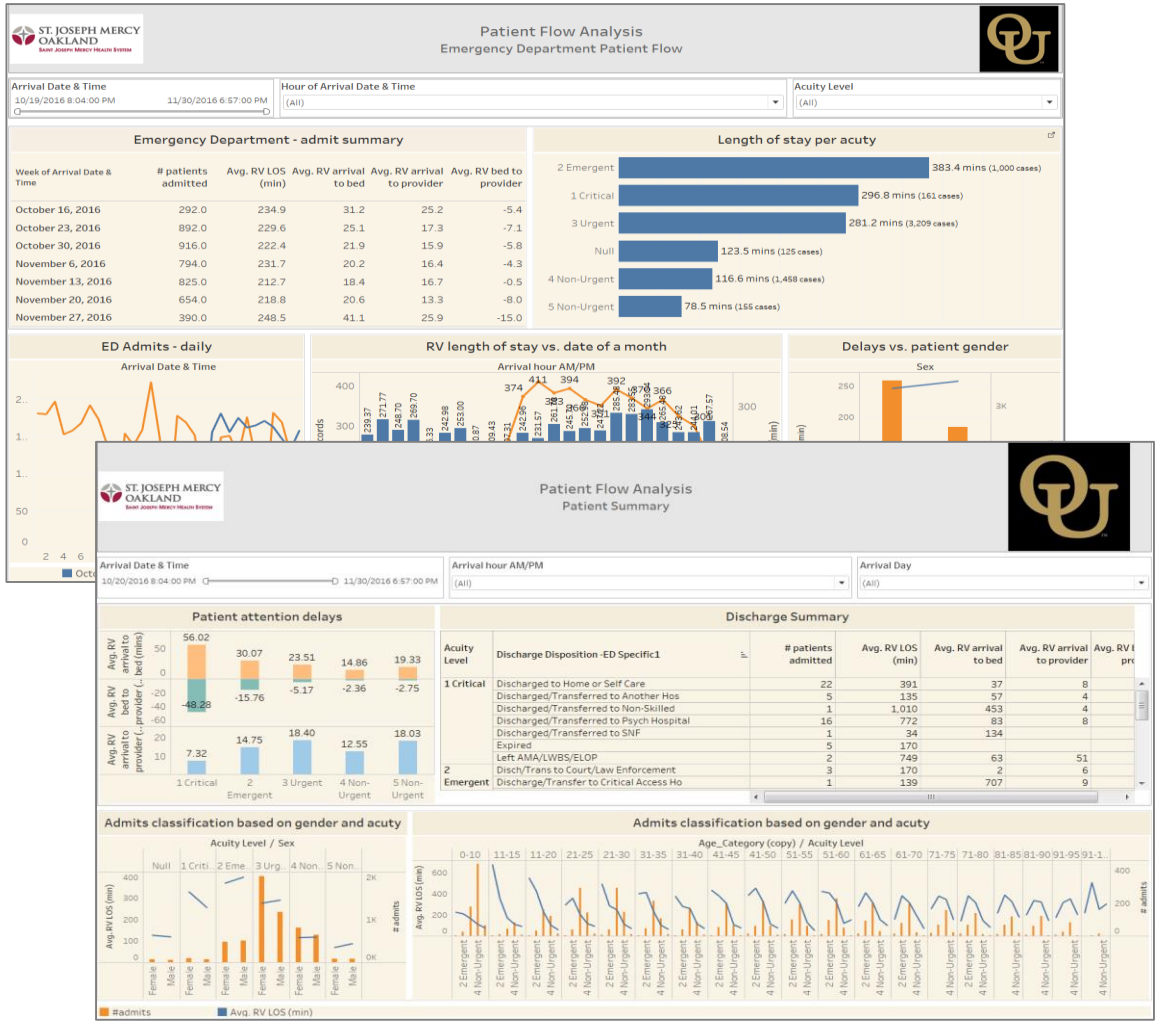
Prior to Admission

Study 7: ED Patient Flow Data



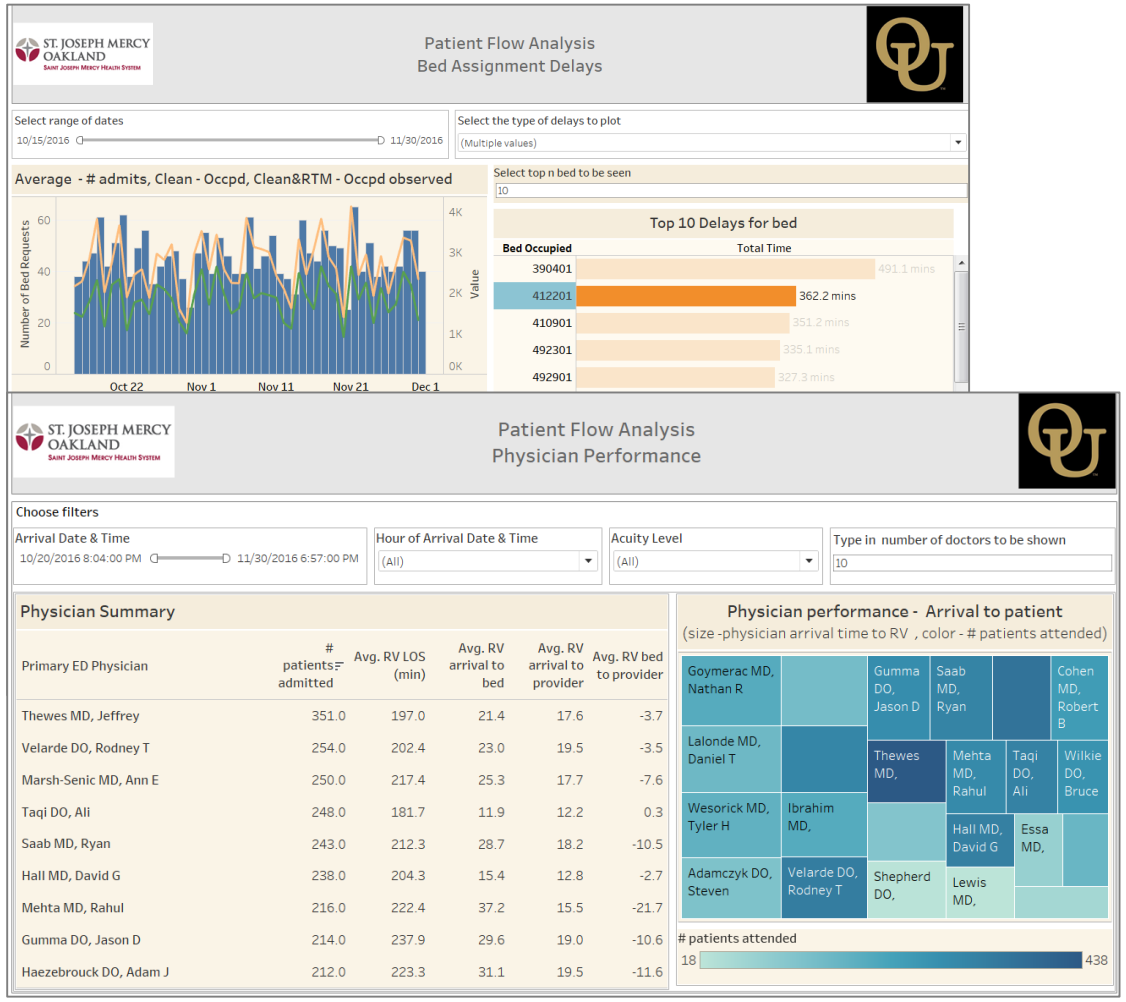
Apart from summary views, separate graphs are provided to view other patterns of interest



Emergency Department Patient Flow:

- Shows patients flow (# admits) across different categories – acuity, month, gender etc.
- User can filter the entire dashboard for a selected range of dates and hours and acuity of patient

Dedicated views for physician performance and trends in bed assignment



Bed Assignment Delays:

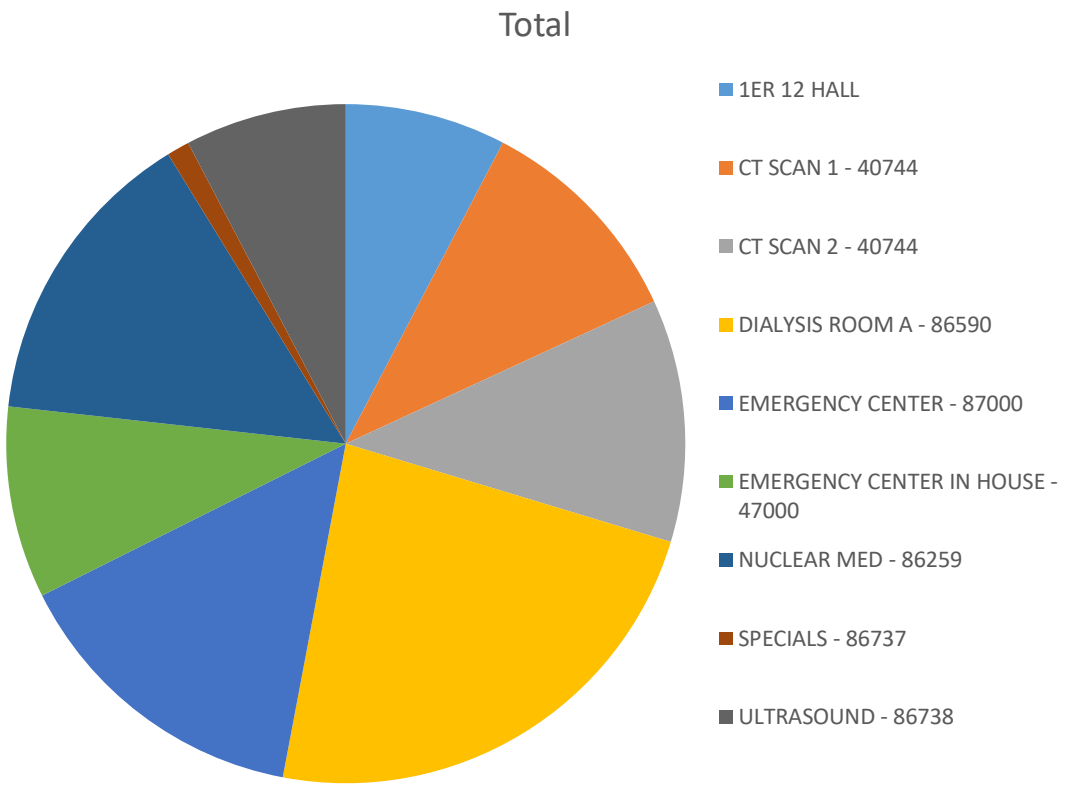
- Shows various trends with respect to bed assignment process
- User can filter the entire dashboard for a selected range of dates and hours

Physician performance:

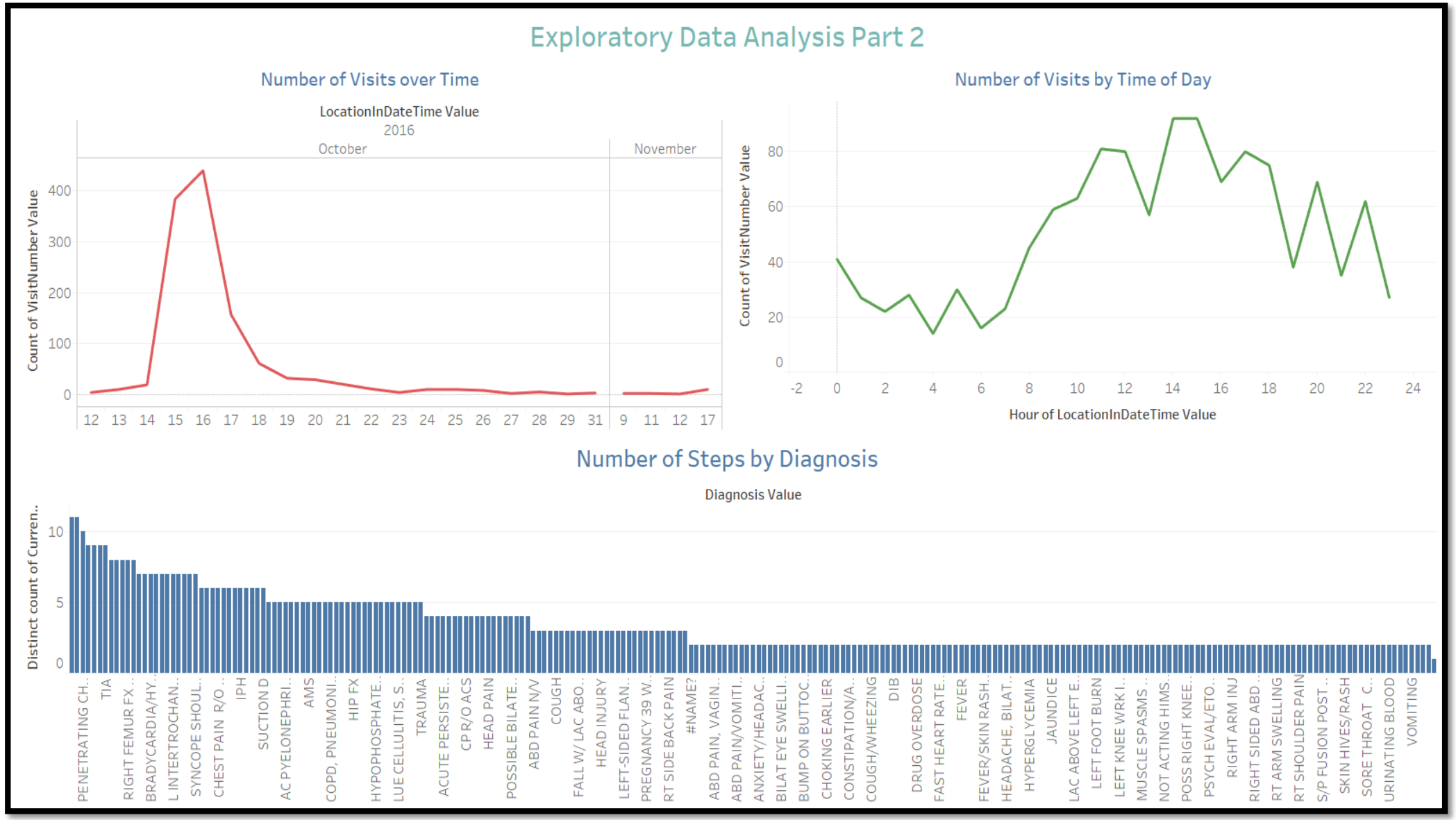
- Shows aggregated delays by physicians
- Capability to filter top ‘n’ physicians and sort them based on a chosen metric.
- A tree map with size based on delays and color based on # patients attended gives a visual classification and rating of physicians.
- User can filter the entire dashboard for a selected range of dates and hours and acuity of patient

Time Spent at Various Locations while in ED

Row Labels	Average of LocationLengthOfStayDuration_Value
1ER 12 HALL	95.43
CT SCAN 1 - 40744	130.35
CT SCAN 2 - 40744	143.98
DIALYSIS ROOM A - 86590	290.35
EMERGENCY CENTER - 87000	182.53
EMERGENCY CENTER IN HOUSE - 47000	113.83
NUCLEAR MED - 86259	180.47
SPECIALS - 86737	13.43
ULTRASOUND - 86738	95.77
Grand Total	174.40



Patient Flow Analysis in ED



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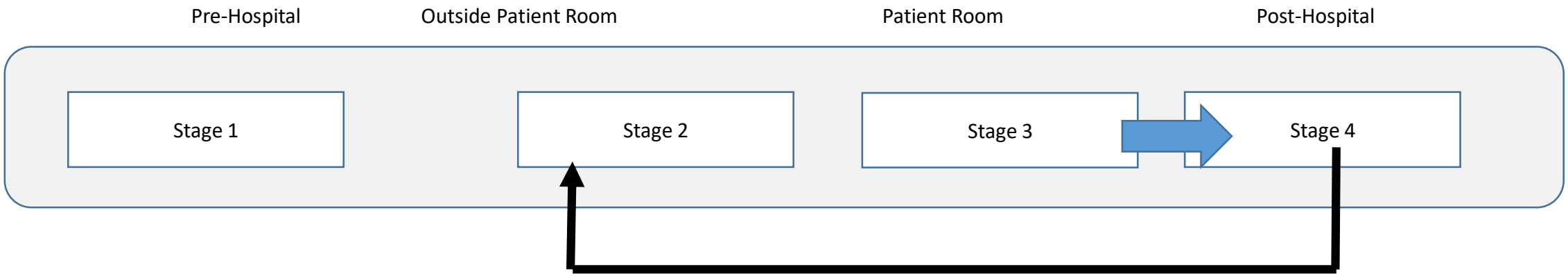

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- Preventive care opportunities

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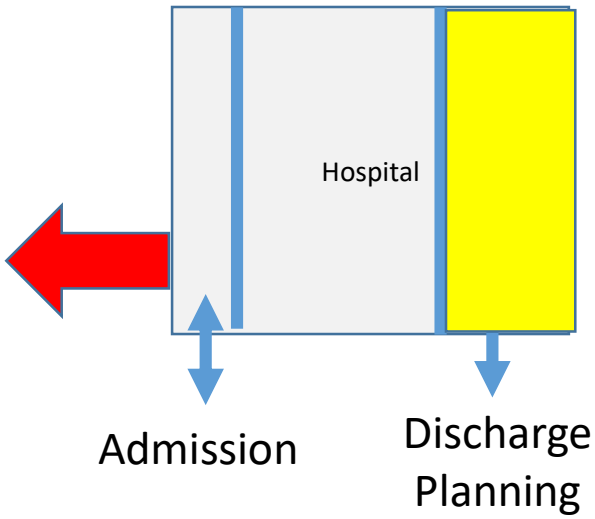

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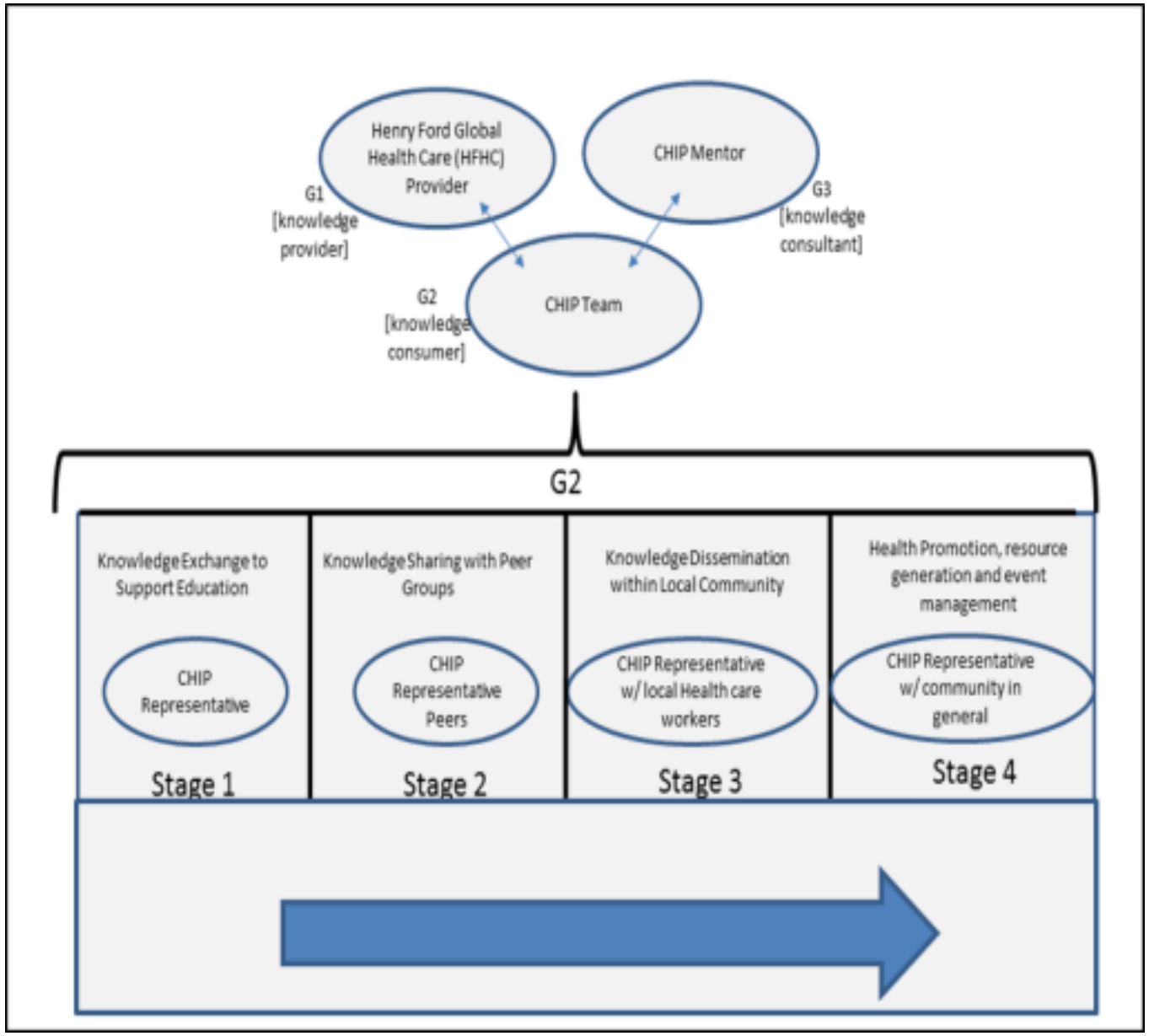
Study 8: CHIP Model – Henry Ford Global Health

- Connect public health workers from different countries
- Educate them on basic clinical and non-clinical training
- Provide them access to mentors/experts
- Allow peers to learn from each other



Study 8: Preventive Strategies
CHIP – Community Health Innovator Program

- CHIP knowledge exchange portal to address global health issues
  - Experts, innovators, and public care workers in support of global health care
    - Web platform under development
    - Business model for social networks
  - Continue to explore the viability of such an approach in rural or urban health

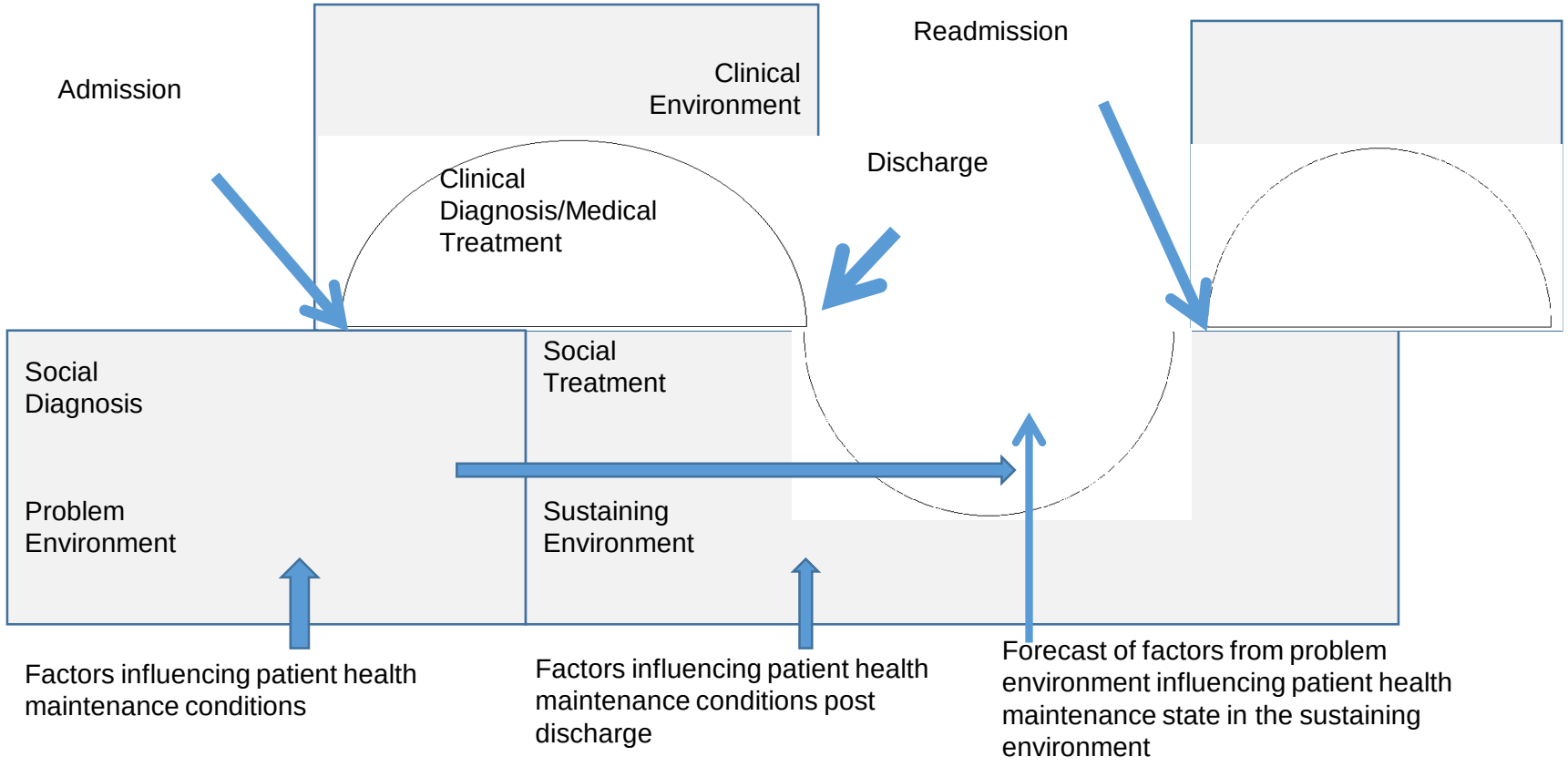
Prentiss, Y., J. Zervos, M. Tanniru, J, Tan, “Community Health Workers (CHWs) as Innovators: Insights from a Tele-Education Pilot for CHWs in Detroit, Michigan” *International Journal of Healthcare Information Systems and Informatics (IJHISI), 2017. Vol 13, 1.*

Khuntia, J, M. Tanniru and J. Zervos, "Extending Care Outside of the Hospital Walls: A Case of Value Creation through Synchronous Video Communication for Knowledge Exchange in Community Health Network," International Journal of E-Business Research, 2015, April-June, Vol.11, No. 2.

Park, Y., Tanniru, M and Khuntia, J. (2014), "Designing an Effective Social Media Platform for Health Care with Synchronous Video Communication," American Journal of Information Technology, 2014, Vol. 4, No.1.

Social Diagnosis

Understanding factors influencing patient performance post-discharge are in-part a reflection of the environment patients live in



4 R Model

- **Roles – patient's roles and social functioning at the onset of the illness**
  - Who the patient is – age, race, vocational or educational, material and parented, incremental and social
  - Assets and deficits – innate assets or deficits in terms of personality, including physical development and mental capacity
  - Prior social functioning – social background and lifestyle (life experiences, parental models, capacity for coping with stress, previous roles, performances and behaviors)
- **Reactions – emotional reaction to the illness and not the illness per se**
  - Feeling about the illness that affect a patient's role and self-concept;
  - Patient's stage of adjustment including shock, denial, depression or beginning integration
  - Reactivation of any prior social dysfunction or psychiatric crisis, and
  - Patient's motivation for coping with the problem)
- **Relationships**
  - Whom the patient relates to and what family he has or does not have for reciprocal impact – impact of family dynamics
- **Resources**
  - Financial
  - Environmental – community setting, physical characteristics and emotional climate
  - Institutional – support systems and outside agencies - vocational, educational, religious, social and recreational
  - Personnel – relatives, friends, associations, organizations

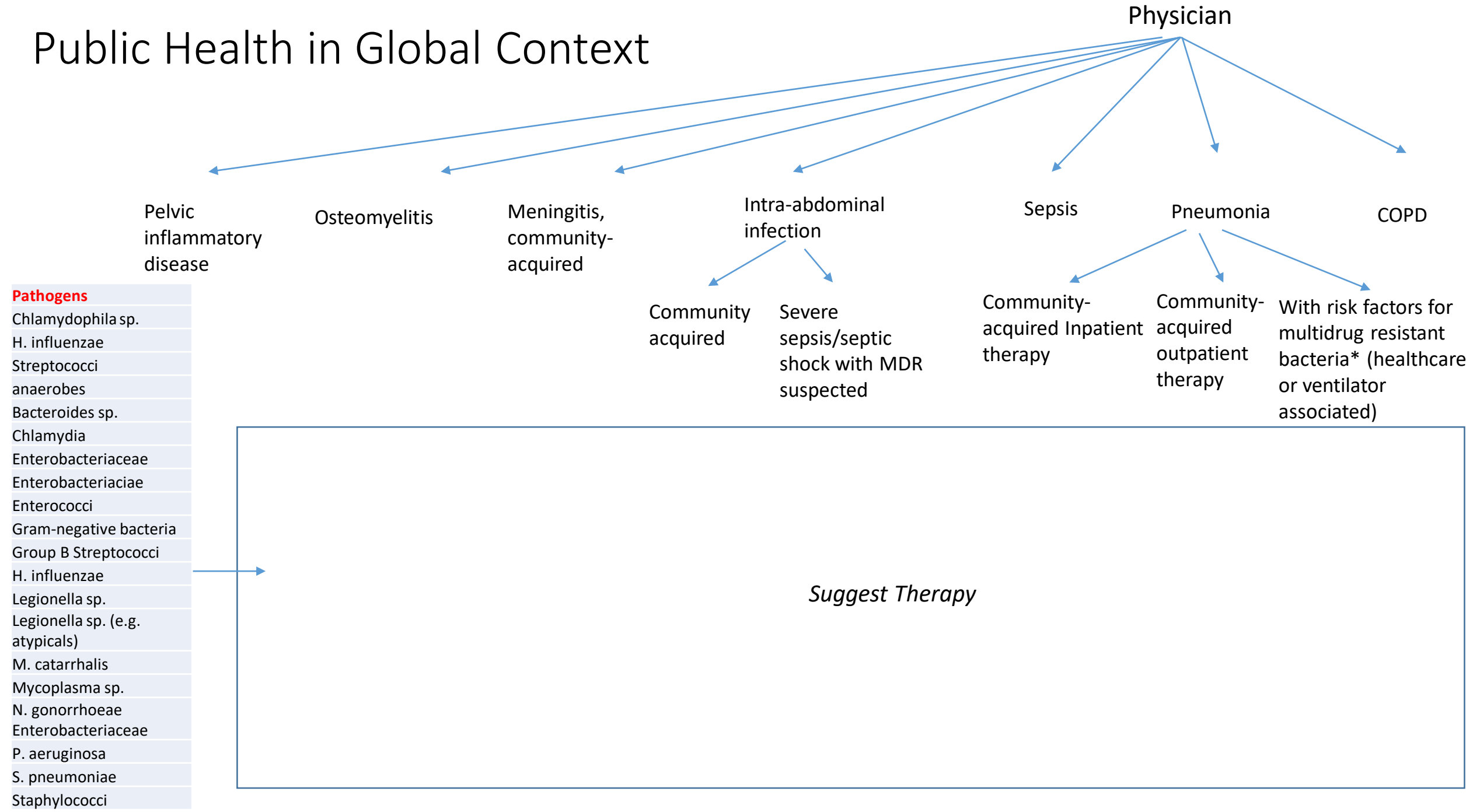
Study 9? - Not yet started -Multi-Criteria Decision Making and Assessing a Patient's Social Risk

Social Characteristics of Patients		
Attribute	Description	
A1	Capable of self health management	Empowerment
A2	Has the knowledge or acquire it for follow-up care	Knowledge Capacity
A3	Has family to help support the care related responsibilities	Distribution of responsibility
A4	Has an opportunity to collaborate with care givers post-discharge	Inter-organizational Linkage
A5	Has inherent risk factors to follow treatment protocols	Factors outside the treatment protocol can complicate effectiveness

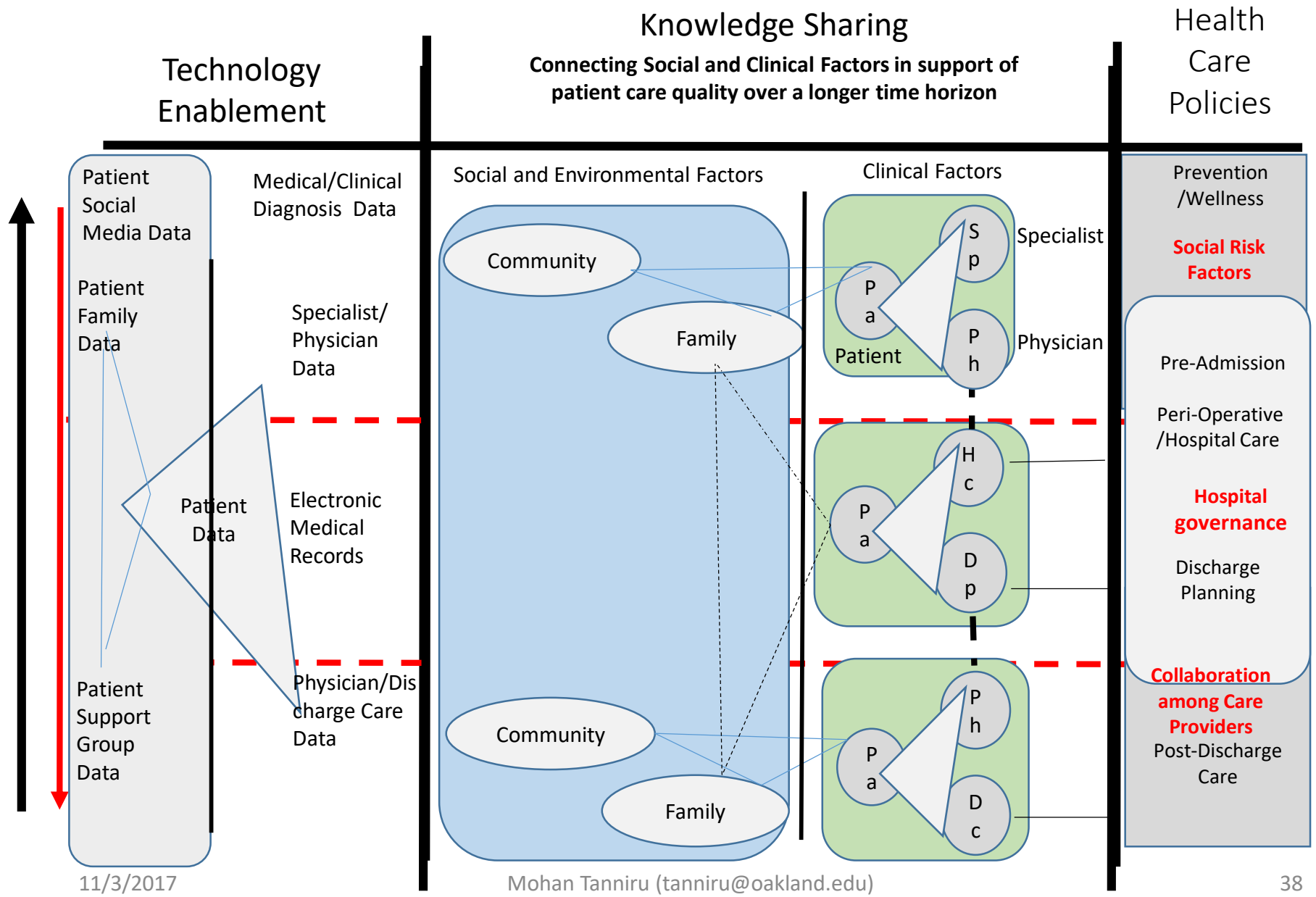
Study 10? - Managing Antimicrobial Resistance through IT- study being initiated

- Antimicrobial resistance (AMR) in low- and middle-income countries (LMIC) is an important issue that would benefit from increased integration of health information technology. This proposed website is a part of a phased approach to help clinicians, policy makers, and program administrators choose targeted interventions based on objective data related to local contexts, and specific resistant pathogens.
  - The First Phase - Specific guidelines for therapeutic action will be provided based on disease state, and pathogen information.
  - Future Phases - Data available using a mobile App and link with some of the laboratory data and antibiogram-level data to the application to make smart decisions based on resistance patterns seen at hospitals. Also, this data will be refined for specific country.

Public Health in Global Context



Summary – Continuity of care need connected health systems across care givers



Questions