California Hospital Association

Emergency/Medical Services/Trauma Committee

December 11, 2018

Mission Inn Hotel & Spa

3649 Mission Inn Avenue, Santa Barbara Room

Riverside, CA 92501

Conference Call Option:

(800) 882-3610 Access Code: 1953936#

EMERGENCY/MEDICAL SERVICE/TRAUMA COMMITTEE

EMS/Trauma Committee Meeting Agenda - December 11, 2018

7:00 VI. ADJOURNMENT
Colangelo

EMS/TRAUMA COMMITTEE
2018 ROSTER

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EMS/T Committee Hospital Representation

BY COUNTY and HOSPITAL TYPE

As of August 20, 2018

HOSPITAL/HEALTH SYSTEM TYPES	
Free-Standing Facility	4
Hospital System	13
Small/Rural Facility	1
University/Teaching Facility	5
TOTAL COMMITTEE REPRESENTATION	17

Denotes number of hospitals/health systems represented within that county.

CHA Member/ED Breakdown
December, 2018

ED TYPE BY MEMBER:

Pam Allen, RN, MSN, CEN	Redlands Community Hospital	Emergency Services
Aaron Wolff	Dignity Health	Emergency Services
Carla Spencer, MSN, RN, CFRN	Salinas Valley Memorial Healthcare System	Emergency Services
Cheryl Heaney, DNP, RN	St. Joseph's Medical Center	Emergency Services
Christopher Childress, BSN, RN, CEN	Hoag Memorial Hospital Presbyterian	Emergency Services
Claude Stang, RN, BSN, MA, CEN	Cedars-Sinai Medical Center	Emergency/Trauma
Connie Cunningham, RN, MSN	Loma Linda University Health	Emergency/Trauma
Daman Mott	John Muir Medical Center	Emergency Services
Fred Hawkins	Ridgecrest Regional Hospital	Emergency/Trauma
Jackie Saucier, PhD, MBA, MSN	Palomar Medical Center Poway	Emergency Services
Jason Zepeda	Hoag Memorial Hospital Presbyterian	Emergency Services
Karen L. Murrell, MD	Kaiser Permanente South Sacramento Medical Center	Emergency/Trauma
Karen Sharp, RN, MSN	Saddleback Medical Center	Emergency Services
Marlena Montgomery, MBA, MSN, RN, CEN	Sharp Memorial Hospital	Emergency/Trauma
Neal Cline, RN, JD, CFRN	Enloe Medical Center - Esplanade Campus	Emergency/Trauma
Rose Colangelo, RN, MSN, CEN	Scripps Memorial Hospital La Jolla	Emergency/Trauma
Rupy Sandhu	UC Davis Medical Center	Emergency/Trauma

EX-OFFICIO COMMITTEE MEMBER:

Bruce Barton	Riverside County EMS Agency
Chi Perlroth, MD, FACEP	CAL ACEP
Daniel Smiley	California EMS Authority
Eric Morikawa	California Department of Public Health
Heather Venezio, RN, MS, CEN TCRN	TMAC
James Pierson	Medic Ambulance
Lawrence Stock, MD, FACEP	Antelope Valley Hospital
Ron Smith, LVN, EMT1A	California Department of Public Health
Susan Smith, RN	CalENA

CHA/REGIONAL STAFF

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David Serrano Sewell	Hospital Council of Northern and Central California
Judith R. Yates, BSN, MPH	Hospital Association of San Diego and Imperial Counties
Keven Porter, RN, BSN, MS	Hospital Association of Southern California
Barbara Roth	California Hospital Association

STATE REPRESENTATION

Northern California	**7**
Southern California	**10**

GUIDELINES FOR THE
CALIFORNIA HOSPITAL ASSOCIATION'S
EMS/TRAUMA COMMITTEE
Updated
09/23/15

I. NAME

The name of this committee shall be the CHA EMS/Trauma Committee.

II. MISSION

The EMS/Trauma Committee represents CHA members that provide emergency medical and/or trauma services in the State of California, and serves in an advisory capacity to the CHA Board of Trustees regarding EMS/Trauma member needs, policies and legislation.

Recognizing the diverse organizations and providers that work in emergency systems across the state, the mission of the committee also includes representation from diverse multidisciplinary health care organizations and associations that include professional associations, regulatory agencies, emergency services organizations, prehospital providers and others, that promote quality emergency services in the state of California. This multidisciplinary group will act as a collaborative source of emergency services expertise, providing a venue for the coordination of emergency and trauma services to advocate for the highest standards of emergency trauma care services across the state.

The purposes of the Committee shall be:

1. to serve as a forum for all CHA members and associated groups interested in EMS/Trauma to receive and exchange information, adopt policies and positions, guide management, adopt strategies and serve as the primary public policy arm of CHA for emergency medical services and trauma issues;
2. to provide CHA member EMS/Trauma providers with a statewide structure dealing with the issues important to their interests;
3. to create a representative form of leadership which is based on participation of all its members;
4. to provide direct input to the CHA Board of Trustees; and
5. to provide a unified voice on behalf of CHA members, taking into account the multiple diverse organizations that interact with hospital emergency/trauma services

III. COMMITTEE

The committee shall consist of a maximum of 22 representatives from California hospital/health system organizations, and organizations with related interests.

A. MEMBERSHIP

1. Membership on the CHA EMS/Trauma Committee shall be based upon membership in

CHA, and reserved for those members.

2. The Committee shall consist of various representatives from large hospital systems, public institutions, private facilities, free-standing facilities, small and rural facilities, university/teaching facilities, specialty facilities and a representative from a professional group specializing in EMS/Trauma issues.
3. Membership by EMS related organizations will be considered Ex-officio members. Ex-officio members will be determined by committee input and CHA determination.
4. Appointment of members to the Committee will follow the CHA Guidelines for Committee Membership.

B. TERMS OF THE COMMITTEE MEMBERS

1. As members leave the Committee, vacancies shall be filled. It is understood that a member forfeits his/her seat if they no longer serve in the capacity, or represent a facility that is not a CHA member.
2. Committee members with specialized skills, knowledge, or professional associations may serve on the committee as ex-officio members. Ex-officio members are not subject to the above terms. These determinations shall be made by CHA.
3. Provider representatives who transition from one position to another are welcome to attend committee meetings during their transition; however, this should not exceed two consecutive meetings.
4. Provider representatives who misrepresent their organization's position are subject to review and dismissal from the committee.

C. COMMITTEE MEETINGS

1. Meetings of the Committee shall be held quarterly.
2. Provider representatives may send an appropriate substitute to the meetings when they are unable to attend. To maintain continuity for Committee meetings, this should be used sparingly, not to exceed two consecutive meetings.
3. Three consecutive unexcused absences by a Committee member may initiate a review by the Chair and CHA staff for determination of the Committee member's continued service on the Committee.
4. Special meetings may be scheduled by the Chair, majority vote or CHA staff.
5. Membership is based on one's ability to be physically present at quarterly meetings and conference call only as needed for emergency situations.

D. VOTING

1. Voting rights shall be limited to members of the Committee, and each member present shall have one vote. Voting by proxy is not acceptable.
2. All matters requiring a vote of the Committee must be passed by a majority of a quorum of the Committee members only at a duly called meeting or telephone conference call.

E. QUORUM

Except as set forth herein, a quorum shall consist of the majority of the Committee

membership in attendance.

F. MINUTES

Minutes of the Committee shall be recorded at each meeting, disseminated to the membership, and approved as disseminated or as corrected at the next meeting of the Committee.

IV. OFFICERS

The officers of the Committee shall be the committee chair, co-chair, and CHA staff. Except as provided herein, the chair and co-chair shall be elected by the Committee for a two-year term.

The chair officers vacate their Committee positions upon election, and their seats shall be filled through the nominating and election process. The past-chairs will be invited by the Committee to serve as ex-officio members.

Should a chair or co-chair vacate his/her position prior to the end of the term, a nominating committee will convene to select a replacement, and assume a two-year term of office.

V. COMMITTEES

For special and specific purposes, the chair or CHA staff may appoint a committee or ad hoc on task force. Membership may be expanded to non-members of the Committee.

VI. GENERAL PROVISIONS

The strategic plan defining the goals, objectives, and work plans shall be developed annually by the CHA staff and approved by the Committee. Quarterly updates and progress reports shall be completed by the Committee and CHA staff.

Staff leadership at the state level shall be provided by CHA with local staff leadership provided by HCNCC, HASD&IC, and HASC. The primary office and public policy development and advocacy staff of the Committee shall be located within the CHA office.

The Committee staff shall be an employee of CHA.

VII. AMENDMENTS

These Guidelines may be amended by a majority vote of the members of the Committee at any regular meeting of the Committee.

VIII. LEGAL LIMITATIONS

Any portion of these Guidelines which may be in conflict with any state or federal statutes or regulations shall be declared null and void as of the date of such determination.

Any portion of these Guidelines which are in conflict with the Bylaws and policies of CHA shall be

considered null and void as of the date of the determination. Information provided in meetings is not to be sold or misused.

IX. CONFIDENTIALITY FOR MEMBERS

Many items discussed are confidential in nature, and confidentiality must be maintained. All Committee communications are considered privileged and confidential, except as noted.

X. CONFLICT OF INTEREST

Any member of the Committee who shall address the Committee in other than a volunteer relationship excluding CHA staff and who shall engage with the Committee in a business activity of any nature, as a result of which such party shall profit pecuniarily either directly or indirectly, shall fully disclose any such financial benefit expected to CHA staff for approval prior to contracting with the Committee and shall further refrain, if a member of the Committee, from any vote in which such issue is involved.

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, RN, MS, NEA-BC, Vice President Nursing and Clinical Services

SUBJECT: CHA EMS/T Edits to Goals and Objectives 2017-2019

SUMMARY

Annually, CHA works with the three regional associations to identify public policy priorities. Each regional association (the Hospital Council of Northern and Central California, The Hospital Association of Southern California, and The Hospital Association of San Diego and Imperial Counties) produces a set of priorities which are then ranked after discussions occur with respective boards. The results this year were consistent with the issue of behavioral health skyrocketing to the top, while issues of quality and patient safety and emergency services have somewhat waned. The results of this year will roll into a three year strategy plan under our new leadership. This input will guide us on major hospital priorities and will inform public policy and advocacy as we move forward.

Ongoing discussions with members, through regional boards, policy centers and committees, as well as other meetings with hospital and health system CEO's and staff will guide us on activity and or any changes that need to be made over the course of time. The top priorities are:

1. Behavioral Health
2. Reimbursement
3. Access to Care
4. Government regulations and mandates
5. Quality and Patient Safety
6. Community Health Improvement
7. Workforce
8. Emergency Services

We therefore need to edit CHA, EMS/T Goal and Objective #2 that reads: "Successfully launch the Emergency Care Systems Initiative to resolve California's overburdened emergency are system with a roadmap for change". My suggestion is: "Successfully monitor California Emergency Care Systems to decrease emergency department crowding and other barriers to emergency department effectiveness"

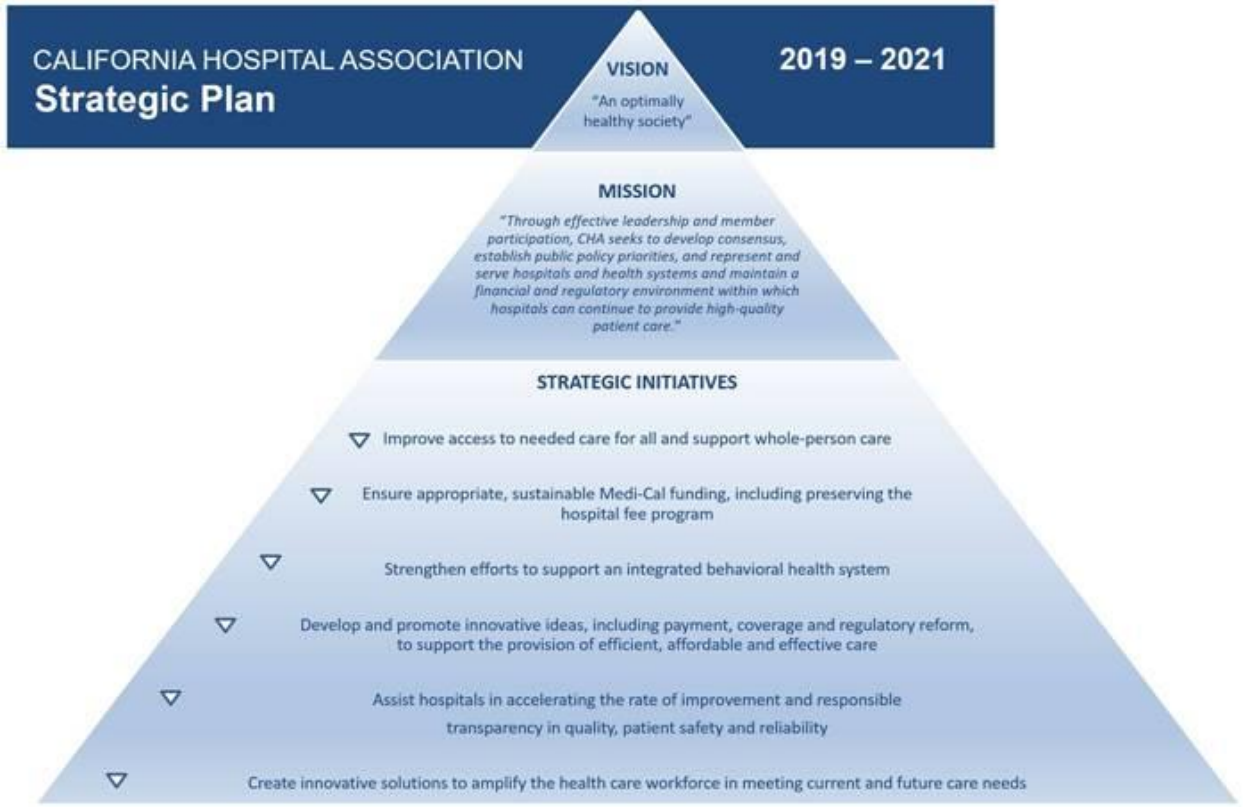
DISCUSSION QUESTIONS

1. What is your assessment of the CEO's strategic priorities?
2. How would you rate your emergency services compared to other priorities voted on by the CEO's?
3. Do you agree to continue the other goals and objectives as listed?

Attachment: CHA Emergency Services/Trauma Committee Goals and Objectives, 2017-2019

BJB:br

2018 Priority Ranking	Combined Regional Association Priority	Hospital Council	Hospital Association of Southern CA	Hospital Association of San Diego & Imperial Counties	2019 Priority Ranking
1	Behavioral Health	Behavioral Health	Behavioral Health	Behavioral Health	1
2	Reimbursement	Reimbursement	Reimbursement	Reimbursement	2
3	Access to Care	Access to Care	Government Regulations and Mandates	Access to Care	3
4	Government Regulations and Mandates	Government Regulations and Mandates	Access to Care	Government Regulations and Mandates	4
5	Community Health Improvement	Community Health Improvement	Emergency Services	Quality and Patient Safety	5
6	Quality and Patient Safety	Workforce	Quality and Patient Safety	Community Health Improvement	
7	Workforce	Quality and Patient Safety	Community Health Improvement	Workforce	
8	Emergency Services	Emergency Services	Workforce	Emergency Services	
9	Cybersecurity	Cybersecurity	Cybersecurity	Cybersecurity	
10	Disaster Preparedness	Disaster Preparedness	Disaster Preparedness	Disaster Preparedness	


CALIFORNIA HOSPITAL ASSOCIATION
Strategic Plan
2019 – 2021
VISION
"An optimally healthy society"
MISSION
"Through effective leadership and member participation, CHA seeks to develop consensus, establish public policy priorities, and represent and serve hospitals and health systems and maintain a financial and regulatory environment within which hospitals can continue to provide high-quality patient care."
STRATEGIC INITIATIVES
Improve access to needed care for all and support whole-person care
Ensure appropriate, sustainable Medi-Cal funding, including preserving the hospital fee program
Strengthen efforts to support an integrated behavioral health system
Develop and promote innovative ideas, including payment, coverage and regulatory reform, to support the provision of efficient, affordable and effective care
Assist hospitals in accelerating the rate of improvement and responsible transparency in quality, patient safety and reliability
Create innovative solutions to amplify the health care workforce in meeting current and future care needs

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

CHA Emergency Services/Trauma Committee Goals and Objectives, 2017-2019

CHA EMS/T Committee Mission

The mission of the CHA EMS/Trauma Committee is to represent CHA members that provide emergency medical and or trauma services in the state of California, and serve in an advisory capacity to CHA Board of Trustees regarding EMS/Trauma member needs, policy and advocacy to promote an optimally health society.

Goals and Objectives 2017- 2019

1. Develop guidance, tools, information and strategies to support emergency department and trauma services of the future that enhance quality patient care.
   a. Connect local and regional best practices with toolkits or web connections.
   b. Explore new technologies and applications to streamline and improve emergency and trauma care practices.
   c. Continue to monitor APOT and work collaboratively with prehospital providers on performance improvement and reengineering efforts.

2. Successfully launch the Emergency Care Systems Initiative to resolve California's overburdened emergency care system with a roadmap for change.
   a. Use performance measures, technology and new modalities to assess ED crowding and strategize solutions across systems of care.
   b. Develop both provider and consumer education vehicles to improve ED crowding.
   c. Develop public policy and advocacy strategies to address ED crowding, particularly alternate destination policies for behavioral health patients.

3. Implement a successful annual ED Forum that assists members to become agents of change during health care reform.
   a. Use state and national experts that emphasize a collaborative, multi-stakeholder level of involvement.
   b. Focus on member evidence based practices that are affecting change.

4. Represent Trauma issues on the EMSA trauma regulatory review task force.
   a. Appoint CHA EMS/T member to head the trauma subcommittee workgroup and present issues at the EMSA trauma task force.
   b. Assist with funding and solutions to maximize trauma care and provisions across the state.
   c. Select CHA EMS/T member to represent EMSC issues and report to the committee

5. Understand HIE systems and how they will benefit transitions of care for patients between systems of care.
   a. Work closely with HIE networks to understand connections and linkages to improved care transitions.
   b. Work with EMSA on HIE prehospital pilot work.

6. Closely monitor federal and state health care reform changes and their effect on emergency services and systems of care.
   a. Continue to monitor changes in the financial landscape that have a direct effect on emergency department visits.
   b. Monitor statutory and regulatory changes affecting hospital emergency /trauma services.

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, MS, RN, NEA-BC, Vice President, Nursing and Clinical Services

SUBJECT: 2019 Committee and Center Schedule Change

SUMMARY

Attached is the email information from CHA CEO, Carmela Coyle. The Co-Chairs engaged in conference calls regarding the 2019 changes. The email summarizes the general goals and objectives for next year's meetings.

DISCUSSION

1) When would members like to schedule the two formal meetings?
2) Are there other association meetings where members coalesce and we could consider an additional meeting?

ACTION REQUESTED

- *Confirm next year's formal meeting schedule (one face to face and one virtual).*

Attachments: Carmela Coyle email
2019 Meeting Date Suggestions

BJB:br

From: Carmela Coyle

Subject: Meeting Schedules to Change in 2019 for CHA Centers, Committees
Date: Tuesday, September 25, 2018 9:31:43 AM

Dear center and committee members:

Thank you so much for the time you commit and all that you do for CHA in your role on one of our 25 centers and committees. To ensure we continue to effectively engage members, we have developed a new proposed meeting schedule for the coming year. This schedule considers feedback we received during discussions with center and committee chairs, as well as staff leads. We have learned that:

- **Centers and committees are critical listening posts for the association.** The input we receive from all of you is essential to developing policy positions on your behalf and advocating effectively. We rely on you to identify emerging issues and guide us in response.

- **Members' availability for in-person participation is increasingly scarce.** The health care environment is changing and your roles within your organizations are even busier. Many of you fly or drive to these meetings, taking you away from critical work back home. Across CHA's centers and committees, in-person participation has declined.

- **CHA's member reach could be expanded.** Given reduced participation in these meetings, we are missing an opportunity to involve more of our 400 hospital members across the state.

- **Quarterly scheduled meetings can lead to meetings without a pressing purpose.** The need to pre-schedule meetings means they may not coincide with our need for your input on key issues or legislation.

To keep our connection strong, continue to benefit from your experiences, and make the best and most efficient use of your time, we propose to lighten the meeting load and focus on more tailored approaches to member engagement:

- Beginning in 2019, centers and committees will hold two formal meetings per year — one in-person and one virtual. Your chair and CHA staff lead will send a memo with more information for the coming year, as the timing and details will vary.

- When issues are emerging or hot, centers and committees may use additional ad hoc calls to get your input at the optimal time. This will allow us to be more nimble and relevant on your behalf.

- To engage even more leaders in our work, centers and committees may convene complementary calls with broader groups of members who share a perspective or interest (e.g., rural, behavioral health, workforce, post-acute care, certification and licensing).

By freeing up time, we hope our staff leads will have more opportunity to come to you — locally and regionally. The more we know and understand your organizations, the more effectively we can advocate for you.

The times are a changin' and technology offers us many ways to stay even more closely connected. We strive to balance togetherness, the challenges of travel and our desire to engage even more of our hospital and health system members.

If you have any questions, feel free to contact me at ccoyle@calhospital.org or (916) 552-7547, or your

center or committee chair.

Carmela Coyle
President & CEO
California Hospital Association

To unsubscribe from CHA communications, please send an e-mail to info@calhospital.org.

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

October 25, 2018

TO: EMS/Trauma Committee Members

FROM: BJ Bartleson, MS, RN, NEA-BC

SUBJECT: 2019 Meeting Schedule

Following is the meeting schedule for 2019 EMS/Trauma Committee meetings:

March 6, 2019	Sacramento, CHA Offices Board Room
June 12, 2019	Sacramento, CHA Offices Board Room
September 25, 2019	Sacramento, CHA Offices Board Room
December 10, 2019	Mission Inn, Riverside 5 – 7 pm Dinner to follow meeting, 7-9 pm

You will receive a save-the-date approximately one month prior to each meeting to verify your attendance/participation.

Thank you and if you have any questions, please feel free to call me directly at (916) 552-7537.

BB:br

CHA EMS/TRAUMA COMMITTEE
MEETING MINUTES
August 29, 2018 / 10:00 a.m. – 2:00 p.m.

1215 K Street, Suite 800
Sacramento, CA

Members Present: **Pam Allen, Neal Cline, Fred Hawkins, Daman Mott, James Pierson, Ron Smith, Carla Spencer, Heather Venezio**

Members Attending by Call: **Connie Cunningham, Jackie Saucier, Susan Smith, Rose Colangelo, Rupy Sandhu, Karen Sharp, Chi Perlroth, Christopher Childress, Jason Zepeda**

Staff: BJ Bartleson, Sheree Lowe, Dave Perrott, Keven Porter, Barb Roth

I. CALL TO ORDER/INTRODUCTIONS

The meeting was called to order at 10:02 am. New members Daman Mott, Aaron Wolff and Christopher Childress were introduced. Review of committee guidelines, and Goals and Objectives.

II. REVIEW OF PREVIOUS MEETING MINUTES

The minutes of the June 27, 2017, EMS/Trauma Committee meeting were reviewed.

IT WAS MOVED, SECONDED AND CARRIED:

- *Minutes approved as submitted.*

III. NEW BUSINESS

A. ED Registration (Zepeda/Childress)
Committee discussed the process for timely ED registration. Hospital personnel cannot ask for insurance or payment information until after Medical Screening Exam (MSE) is completed. The patient can offer the information, but the hospital personnel cannot ask for it until after the MSE. In that case, hospital staff can make a copy, but not do anything with it until after the MSE.

At UC Davis, their process is to initiate, but not complete the MSE at triage. Their legal department has reviewed and approved this process and they have not had any issues. Ms. Sandhu will check her policy on this and report back to the committee.

Ms. Colangelo offered to provide information on Scripps Memorial's ED registration process. Their turnaround time for registration is about 8 minutes.

- *ACTION: Ms. Sandhu and Ms. Colangelo to report back on their respective hospitals' registration processes.*

B. Ligature Risk Policy (Perrott)

CHA and TJC will host a webinar regarding ligature risk on October 2. TJC developed recommendations, which CMS agreed to accept. TJC also published several FAQs on their website. The CMS interpretive guidelines are not yet complete.

ED staff must complete a suicide risk assessment for everyone (including pediatric patients) being seen in the ED. UC Davis screens everyone above 9 years old. If someone is a suicide risk, the hospital must have a **designated** ligature risk-free room. If that is not available, 1:1 monitoring is required at all times, even during lunch and break times. A video monitor can be used, but it has to be a dedicated video/monitor. CMS addressed this in their July memo, accepting TJC recommendations, and will be incorporating this into their interpretive guidance. When law enforcement brings someone to the ER as 5150, the patient is automatically deemed a suicide risk. ER Techs, CNAs and nurses can be trained to conduct the assessment.

TJC is now surveying under these new standards. During the survey, the hospital must provide information regarding the education provided.

- *ACTION: Information only.*

C. EMS Commission Administrator Appointee
Appointments for agencies like EMSA are made by staff working for the Governor. That staff person often looks to CHA for recommendations. CHA does not choose who to present, but offers suggestions to the Governor's office. They are currently seeking recommendations for CEO position appointments. Mr. Hawkins has advised CHA that his CEO is interested. CHA is looking for more candidates (would like three altogether).

- *ACTION: Advise Ms. Bartleson of CEO interest in participating on the EMSA Commission.*

D. SB 432 - AFL 18-06
This law, revising notification procedures for situations when prehospital emergency medical care providers may have been exposed to a reportable communicable disease or condition that could result in transmission, became effective January 1, 2018. Mr. Smith advised three distinct people to be notified: designated officer, county public health officer, designated health officer. Hospital and pre-hospital (EMS, not law enforcement) personnel notify the county.

- *ACTION: Information only.*

E. Physician Education on Disaster Training
Information is provided as a follow-up from the last meeting and can be used as a template for hospitals to educate physicians. Incentive is needed for a hospital physician to sit on a disaster committee. For a verified trauma hospital, the ED MD has to be trained. Although not a requirement, surveyors are looking for disaster training - something to show that disaster training is included in trauma care.

- *ACTION: Information only.*

F. LEMSA Designation Fees

Kern County had never charged fees in the past, but is now planning to charge fees for Trauma, Stroke and STEMI. Hospital Council has not been able to get information regarding what the money is for and why it is needed. Mr. Pierson advised that the ambulance service has to pay ½ million dollars.

- *ACTION: Discussion about including this in legislation for next year.*
- *ACTION: Information only.*

G. Title 22 Update
There is not much in the recent update that affects EMS directly. Program Flexibility allows permission for pilot projects and alternate options for extenuating circumstances. Notify the local District Office and go through the proper project approvals for Program Flexibility.

- *ACTION: Information only.*

H. Time in ED – Impact on Reputation
Keeping patients informed about their status is helpful for improving satisfaction scores. Ms. Colangelo advised that Scripps collaborates with a local nursing school. They use nursing students during their last year of school for a compassionate care course. Saddleback Memorial uses a similar program through Concordia. The students get credit for it.

- *ACTION: Information only.*

IV. LUNCH

V. LEGISLATION

A. Emergency Services Legislation
AB 2961 – APOD bill – LEMSAs report offload times. There is still data transmission discrepancy between EMSA and the various LEMSAs. Data does not correlate in all cases. Reporting requirement is "transfer of care time" measured by provider-to-provider transfer of care and movement onto the hospital gurney or chair. Sometimes the LEMSAs are measuring back in service versus transfer of care, so it can be a significant difference if not monitored and measured appropriately.

SB 1152 – Homeless bill. CHA was able to get the scope of this bill narrowed down as much as possible, to include the things that most hospitals are already doing. The preemption language, which means that counties will be able to make more rigid regulations, is the most problematic issue and CHA was not successful in getting it removed.

AB 263 – Mandatory breaks. Not active yet. Private ambulance providers to have mandatory breaks for lunch and 15 minute breaks.

- *Information only.*

VI. OLD BUSINESS

A. Behavioral Health Symposium and ED Forum Update
The next EMS/Trauma committee meeting will be on Tuesday night before the ED Forum – December 11 at the Mission Inn in Riverside, CA.

- *ACTION: Please RSVP your participation as soon as possible.*

B. Behavioral Health Action Update (Lowe)
The coalition is meeting every 3-4 months. Randle Communications has been actively engaged in publicizing this initiative. CHA and NAMI are working together.
More information will be provided on the website by Monday, September 4. CHA is hoping to get California Democratic Gubernatorial candidate Gavin Newsome to participate in a political forum on BH between now and the election in November. The forum will be an invitation only event. CHA is planning another BH event to reach out to the four leaders of the Senate and Assembly. The Coalition is pushing the candidates to publicly acknowledge that BH is important and will be a priority when they get into office.

Randle Communication is reaching out to everyone running for statewide office, asking each of them to provide a written position or taped video on BH. The Coalition is also encouraging voters to choose only candidates with a stated BH position. CHA may engage CEOs at hospitals to do the same thing.

Randle is also involved in Op-Eds to be placed in newspapers such as Modesto Bee, San Diego Union Tribune, Sacramento Bee, and San Francisco Chronicle as well as other social media platforms.

Our Health California is a platform which over 1 million people receive push notifications to their phones on current affairs and issues.

- *ACTION: Information only.*

C. APOT
CHA currently has a written toolkit. Question posed to the committee to consider whether it is time for a second edition.

- *ACTION: Ms. Bartleson and Ms. Allen will create an outline to present to the committee at the next meeting.*

D. Community Paramedicine
Mr. Pierson reported good results from their pilot. Disease only readmissions are very low. Patient satisfaction scores are very high. Forty-five percent response rate from survey and scores are highest in the country. They are assisting North Bay with their discharge process. Ms. Venezio reported that it is working better than their own internal home health program is working.

Mr. Cline reported that they retooled their program in November 2017, eliminating cardiac care and focusing on heart failure patients. They have experienced no specific improvement for disease only readmissions due to high level of drug use. All cause readmission has improved. They experienced downtime for 6 weeks due to transition to EPIC. In discussion with OSHPD on what can be done to continue the pilots, CHA was advised they need something from the governor or legislature. There have been several versions of community paramedicine pilot projects over the past 3 years.

Alternate destination is another triage system where drunk or patients with behavioral health issues are triaged and taken to another more appropriate location. San Francisco

and Fresno LEMSAs have been interpreting their regulations to allow them to do alternate destination for years. CHA would like to change two things in the EMSA statutes for alternate destination and community paramedicine.

AB 1795 (Gipson) Alternate Destination for Sobering Center and BH had good inertia. The medical board and key stakeholders were enthusiastic. Unfortunately, the bill was held in Assembly Appropriations Committee. There was opposition from CNA and physicians concerned about patient care, even with the research showing that it is working.

Once AB 1795 was held, firefighters sponsored SB 944, which restructured the whole system. This bill had community paramedicine but also had many other infrastructure items that made it difficult for CHA to support. It was held in committee as well.

AB 3115 (Gipson) was introduced, got waivers from committees and will go to the Senate floor this week. It also has many provisions that are unacceptable to CHA and our members. Since this bill and AB 1795 were both sponsored by Gipson, CHA is trying to make sure everyone knows this is not our bill nor our amendments. CalACEP has recently come out supporting the bill. If it goes through committee, governor may not sign it.

- *ACTION: Please call your legislators to oppose AB 3115.*

E. EMS Trauma, Stroke, STEMI, EMS-C Regulation Updates

- *ACTION: Information only.*

VII. REPORTS

A. EMSA (Smiley)
No report.

B. ENA (Susan Smith)
No report.

C. TMAC (Venezio)
No report.

D. CDPH (Ron Smith)
Data provided regarding impact on facilities during the Mendocino and Carr fires.

E. Ground Ambulance
No report.

F. Air Ambulance
No report.

G. Cal ACEP (Perlroth)
No report.

H. EMS-C (Venezio)
No report.

VIII. NEXT MEETING

December 11, 2018
5-7 pm
Mission Inn, Santa Barbara Room
Riverside, CA

- *ACTION: Please RSVP your attendance as soon as possible.*

IX. ADJOURNMENT

Having no further business, the meeting adjourned at 1:45 p.m.

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: Fred Hawkins, Director of Emergency Services, Ridgecrest Regional Hospital

SUBJECT: Medical Transportation Liabilities

SUMMARY

Fred is sharing information on EMS consultation regarding medical transportation liabilities and responsibilities.

DISCUSSION QUESTIONS

1. Is the information relevant to all hospitals or just those with medical transportation services?
2. What type of transportation services? ALS, BLS ambulance or other?
3. Does the liability issue connected to reimbursement?

BJB:br

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, RN, MS, NEA-BC, Vice President Nursing and Clinical Services

SUBJECT: Emergency Department Benchmarking Alliance

SUMMARY

San Diego does an annual Emergency Department Survey that demonstrates specific information on throughput and clinical care. Dr. Lev has spearheaded this work and uses the Emergency Department Benchmarking Alliance, (EDBA) (edbenchmarking.org), and adds additional questions relative to the needs/requests of the San Diego Emergency Medicine Oversight Commission (EMOC). Attached are the 2018 results from the Annual Conference last month.

I recented contacted Dr. Jim Augustine, Director of the EDBA, for additional information. He informs me there are 122 California hospitals who belong to the EDBA. HQI data analytics staff are assisting in helping us understand ED discharge data. Each of you collect information. The specific information the San Diego EMOC collects could be very useful in understanding ED operation from a local, regional or state level.

DISCUSSION QUESTIONS

1. Do you see this information as useful?
2. Do you belong to the EDBA? If not, do you know anyone who does?
3. Would information like this about your surrounding regional EDs be helpful to you and you leadership team?

Attachments: EDBA Data Survey 2017
2018 San Diego – Emergency Departments Survey Results – Roneet Lev
Using Data to Drive Emergency Department Design: A Metasynthesis

BJB:br

EDBA Member,
Please submit your 2017 EDBA data report this week.
Thanks to all of you for serving the emergency needs of your community
Jim Augustine, MD
Vice President, EDBA

Annual EDBA Data Survey for Calendar Year 2017
When completed, please submit to edbadata@gmail.com

Who is completing this report, and your position?
What ED is this? What City is this in?
Is the ED an urban, suburban, or rural facility?
Is this a Trauma Center Level I, II, III, or IV or no designation?
Do you participate in training Emergency Medicine residents?

What were the total ED Visits for 2017?
What % High Acuity (DEFINITION: Physician CPT code level 4 + 5 + critical care)
% of patients under age 2? % of patients between 2 and 18 years of age?

What % of ED patients were admitted (DEFINITION: INCLUDES BOTH full and observation admissions)?
What % of TOTAL hospital admissions come through the ED (INCLUDES full and observation admissions)?
What % of ED patients were transferred out to another hospital?
What % of patients arrived by EMS? Of patients arriving by EMS, what % admitted?

What was:
MEDIAN Length of Stay for ALL patients?
MEDIAN Length of Stay for Treat and Release Patients?
MEDIAN Length of Stay for Fast Track Patients (if you have one)?
MEDIAN Total Length of Stay for Admitted Patients?
MEDIAN Admit decision to departure time (CMS Measure)?
MEDIAN time for patients from Door to "Bed"?
MEDIAN time for patients from "Bed" to "Doctor Sees Patient"?
What % patients Left Before Treatment was Complete (LBTC) (DEFINITION: INCLUDES ALL PATIENTS WHO LEFT BEFORE OR AFTER TRIAGE, ELOPED, LEFT AMA, OR ANY OTHER DESCRIPTOR USED TO IDENTIFY PATIENTS WHO LEAVE BEFORE TREATMENT IS COMPLETE)?

Studies Used in ED (DEFINITION: Number of these procedures performed per hundred patients seen):
EKGs? Simple Xrays? CT scans? MRI images? Ultrasounds?

ED Design Elements:
What is gross square footage of ED? How many patient care spaces in the ED (or ED beds)?
Which of these Patient Service Units are present in or around your ED, and under ED staff management:
Fast Track____ Trauma Service Area_____ Clinical Decision Unit/Obs _____ Follow-Up Clinic____

Does the ED Intake Model:
Include Physician Triage? Y/N Include APP in Triage? Y/N

How is Emergency Physician Documentation Performed:
Computerized Y/N Dictated Y/N Template Y/N Scribes Y/N

The Number of Clinical Staff Hours in an Average Clinical Day:
Nurse _____ Tech ____ Clerk ____
MD ___ APP ___ Resident ___ Scribes ____

2018 San Diego Emergency Departments Survey Results

Roneet Lev, MD, FACEP

About the Data

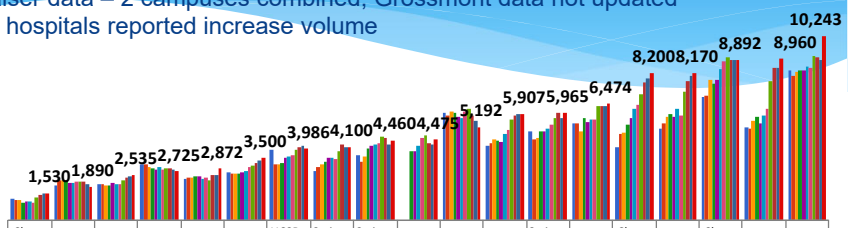
- Questions from EMOC members
- Voluntary
- Blinded by hospital (unless public data)
- To be used for self-improvement rather than competition
- 19 Hospitals, 100% participation
- Results– improved throughput and clinical care
- National Standards: EDBA 2016:
  - 1,449 EDs – 63 million visits
  - 135 Free Standing EDs - 2.5 million visits
- Advise given is from Dr. Lev

EMERGENCY DEPARTMENT BENCHMARKING ALLIANCE
edbenchmarking.org

3

EDs Census

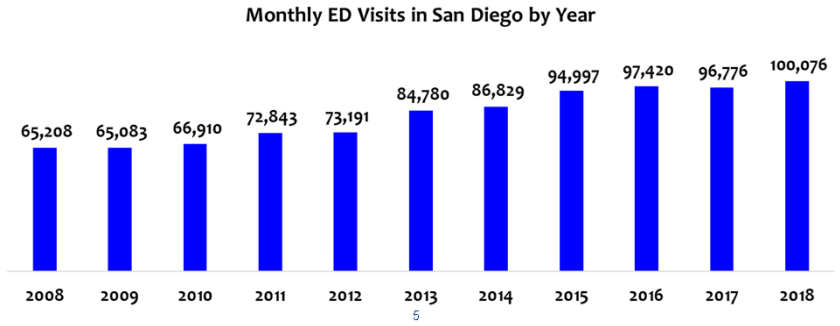
- Monthly Volume June 2016 - June 2017 with trends
- 19 HOSPITALS
- Kaiser data – 2 campuses combined, Grossmont data not updated
- 14 hospitals reported increase volume



	Sharp Coronado	Alvarado	UCSD - La Jolla	PVH	Pomerado	Scripps La Jolla	UCSD - Hillcrest	Scripps Encinitas	Scripps Mercy CV	El Centro	Tri-City	Sharp CV	Scripps Mercy SD	Naval	Sharp Memorial	Childrens	Sharp Grossmont	Palomar	Kaiser
2008	1,200	1,942	2,000	3,100	2,291	2,694	3,900	2,750	3,634		6,000	4,134	4,949	5,380	4,100	5,100	6,876	5,158	8,297
2009	1,145	2,208	2,000	3,125	2,400	2,621	3,100	2,985	3,274		5,793	4,299	4,481	5,379	4,800	5,419	6,954	5,100	8,031
2010	1,097	2,243	1,921	2,950	2,366	2,592	3,092	3,093	3,526		6,025	4,505	4,592	4,964	4,900	5,742	7,790	5,512	8,250
2011	967	2,192	1,949	2,925	2,479	2,613	3,171	3,227	3,977	3,810	5,995	4,437	4,935	5,674	5,300	5,907	7,559	5,726	8,363
2012	1,019	2,103	2,052	2,800	2,458	2,667	3,476	3,484	4,103	3,846	5,750	4,324	4,933	5,490	5,700	5,769	7,800	5,417	8,305
2013	1,020	2,103	2,000	2,954	2,300	2,727	3,530	3,475	4,210	4,119	5,669	4,788	5,121	5,604	6,200	6,182	8,413	5,800	8,565
2014	1,010	2,125	2,040	2,800	2,352	2,955	3,656	3,416	4,254	4,577	6,022	5,019	5,317	5,620	6,400	5,839	8,811	6,178	8,438
2015	1,302	2,180	2,241	2,894	2,236	3,052	3,947	3,828	4,634	4,717	6,171	5,643	5,714	6,359	7,000	7,125	9,084	7,715	9,155
2016	1,407	2,153	2,349	2,906	2,522	3,170	4,067	4,200	4,557	4,320	5,850	5,859	5,960	6,324	7,700	7,706	8,892	8,438	9,040
2017	1,491	2,010	2,423	2,850	2,500	3,358	4,107	4,038	4,189	4,188	5,500	5,915	5,661	6,322	7,900	8,036	8,892	8,500	8,896
2018	1,530	1,890	2,535	2,725	2,872	3,500	3,986	4,100	4,460	4,475	5,192	5,907	5,965	6,474	8,200	8,170	8,892	8,960	10,243

San Diego ED Census

- Annual ED Visits for San Diego: **1,200,912** (San Diego is 1% of US)
- Increase in past year
- Nationally: 150 billion patients in 2016
  - CDC: 2.5% growth per year since 1992
  - FDBA: 4.3% increase in 2014 , 2015



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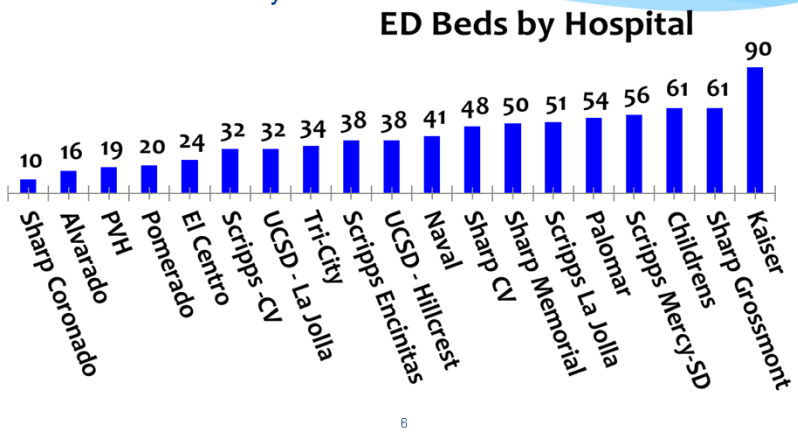
ED Beds Per Hospital

- Stable Bed Capacity
- Does not include hallway beds



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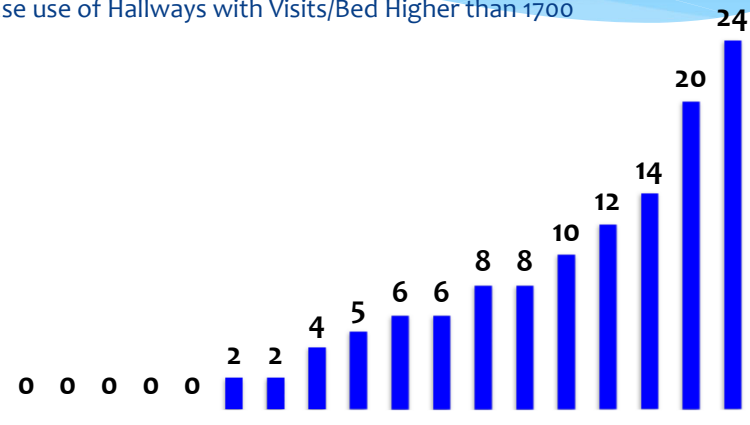
San Diego ED Hallway Beds

- Most EDs use Hallway Beds
- Increase use of Hallways with Visits/Bed Higher than 1700



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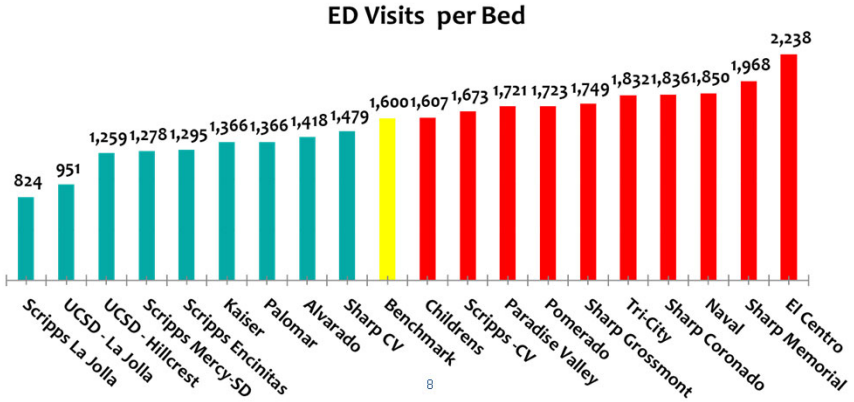
ED Visits per bed – by hospital

Annual Visits/Beds (not including hallway beds)

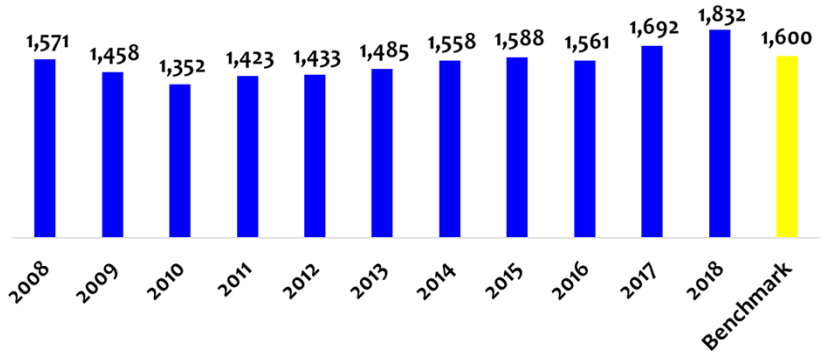
- ED Solutions Benchmark: should not exceed **1600**
- **Red** = Not enough ED beds; **Green** = Enough ED beds



ED visits per bed – total county

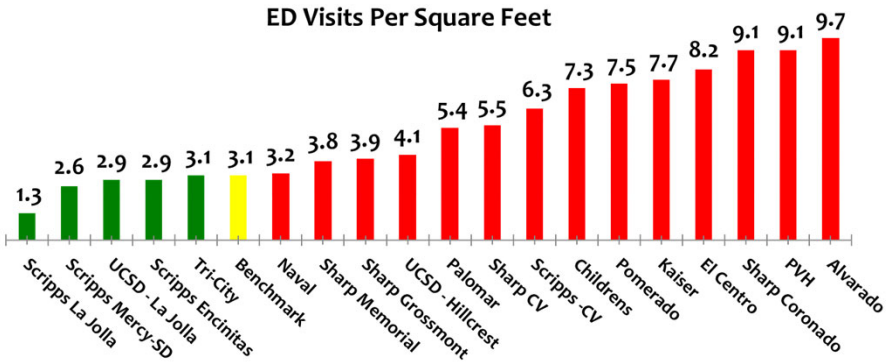
total census divided by number of ED beds for all county

- 2017: 1,200,912 patients / 775 ED beds = 1550
- Benchmark: **1600** ED Solutions; **1555** EDBA
- San Diego ED bed capacity, similar to national benchmark (not including hallway beds)



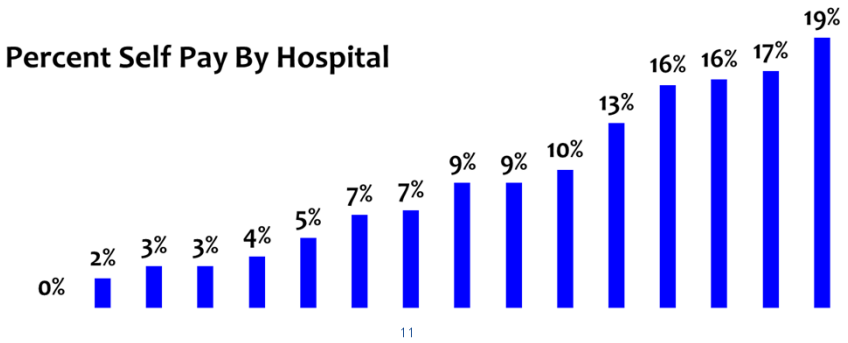
ED Visits Per Square Foot

- EDBA 2016 = **3.1**
- San Diego Average = **5**



% Self Pay

- Self Pay Range: **0 – 19 %** High in 2013 = 30% , High in 2017 = 15%
- San Diego Average **9.2%**
- 2017 CDC Percent Uninsured under age 65 **10.4%**
- No Correlation between Number of Beds or LOS
- Large Disparity between hospitals



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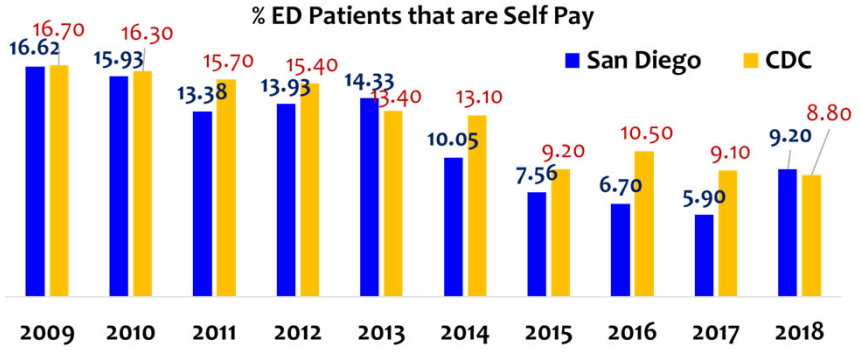
% Self Pay - Trend

- % Self Pay down Nationwide
- San Diego Self Pay higher this past year



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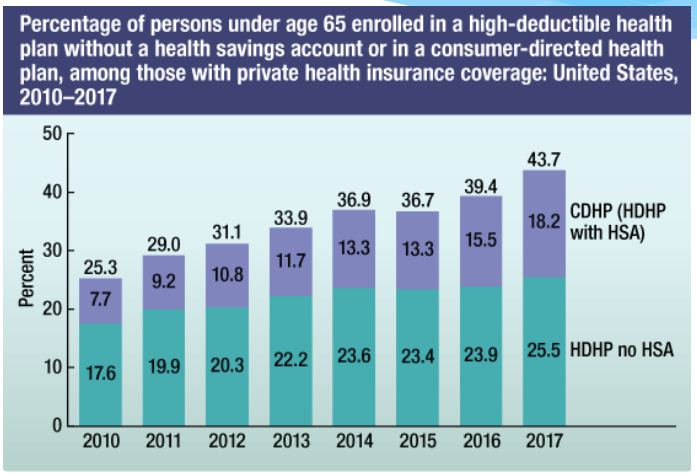
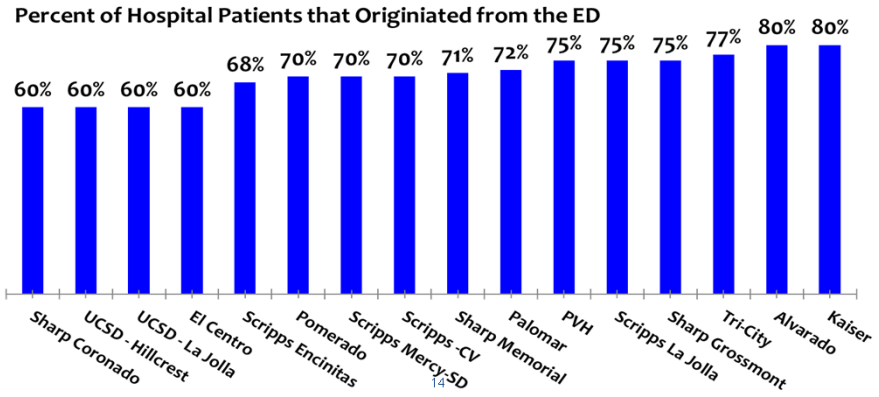
National Statistics of People who are "underinsured"



Hospital Patients that originated from the ED

- San Diego Average: **70%**
- EDBA 2016: **69** % all EDs
  In 1980 = 32%, In 1990 = 50%



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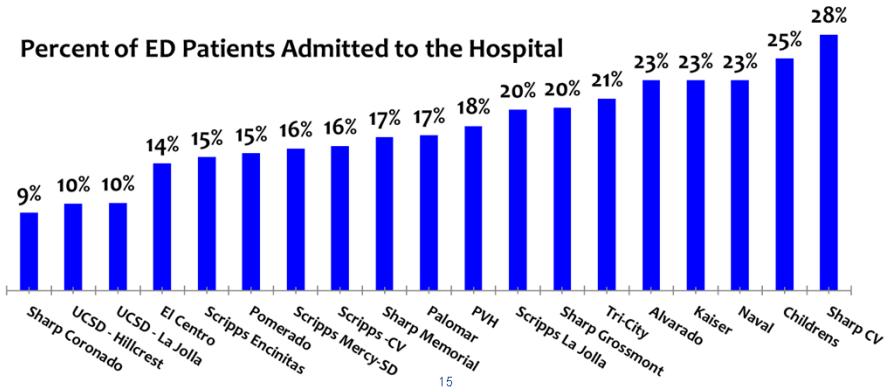
Percent of ED Patients Admitted (inpatient and observation)

- San Diego Average Admissions **18%** (stable)
- EDBA 2016: **16.7%**
- Correlation with acuity



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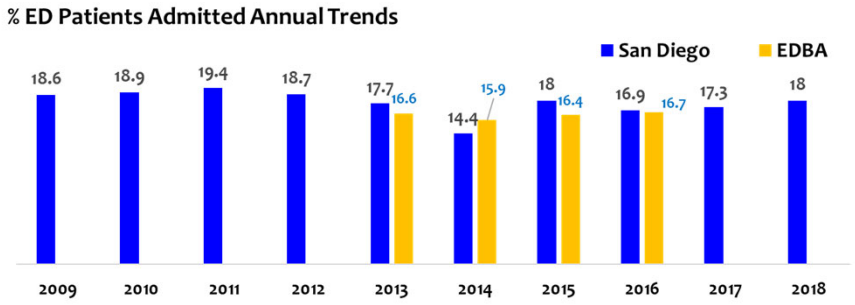
% ED Patients Admitted San Diego and National Averages

- San Diego Average Admissions **17.3%** stable)
- EDBA Average 2016: **16.7%**, stab le for 5 years
- EDBA 2015: **16.4 %** all ED, **24.4.%** adult ED, **10%** Peds ED



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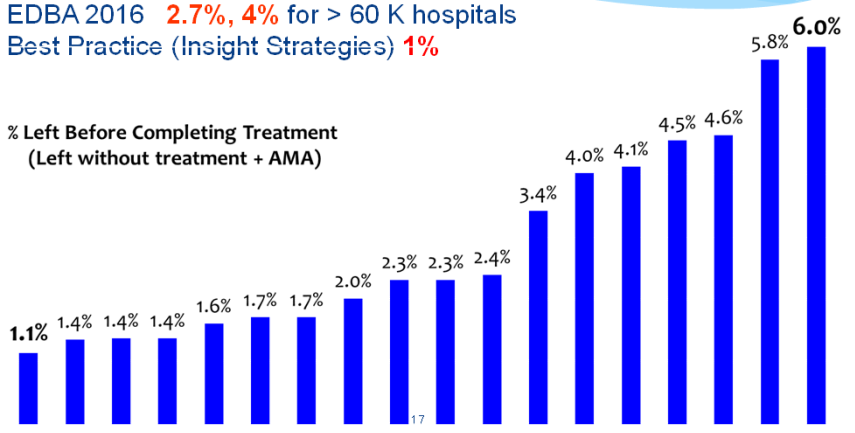
% LWOT (left without treatment) – by hospital

- Range 1.1% - 6.0% range
- Median **2.3%**
- EDBA 2016 **2.7%**, **4%** for > 60 K hospitals
- Best Practice (Insight Strategies) **1%**



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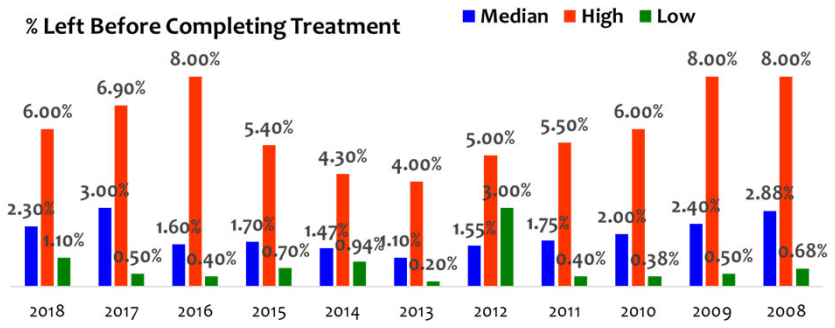
% LWOT (Left without treatment) – all San Diego EDs

- San Diego performance **improved**
- San Diego **around** National Average



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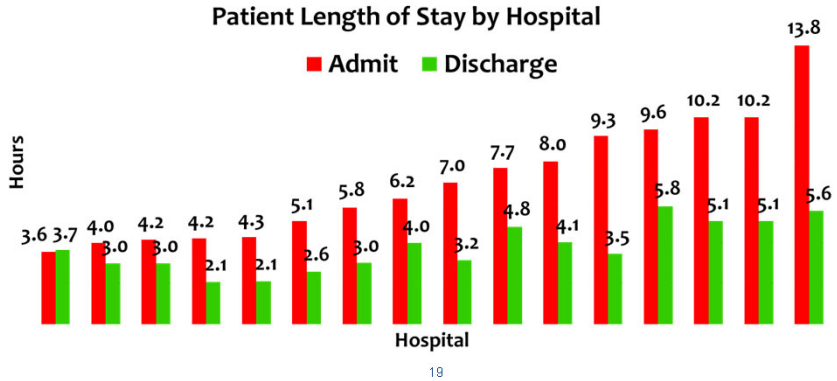
Length of Stay

Admit LOS
- **3.6 – 13.8 hours**
- **7.1** average
- **5.1** EDBA 2016
- **3.5** gold standard

Discharge LOS
- **2.1 – 5.6 hours**
- **3.8** average
- **2.6** EDBA 2016
- **2.0** gold standard



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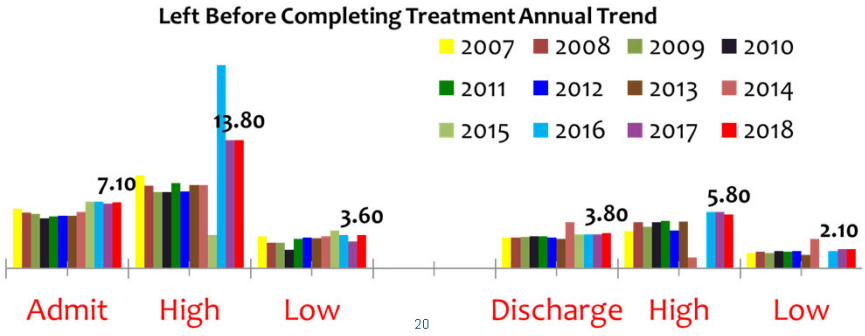
Length of Stay – Trend for all EDs

- **LOS Admitted 7.1** hours
  EDBA **5.1**, Gold Standard **3.5** hours
- **LOS discharged 3.8** hours
  EDBA **2.6**, Gold Standard **2.0** hours



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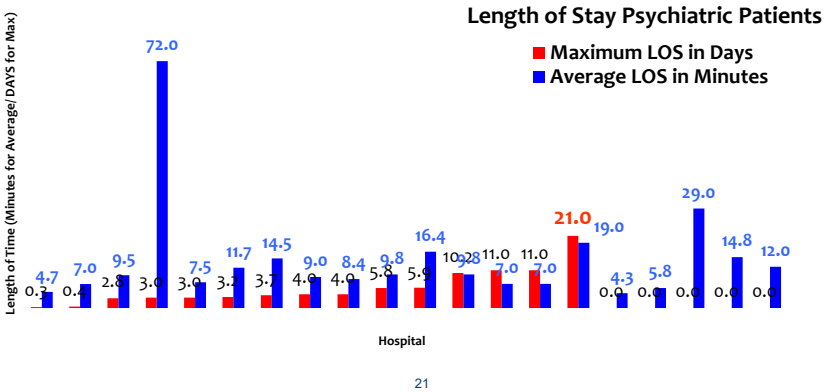
Length of Stay of Psychiatric Patients

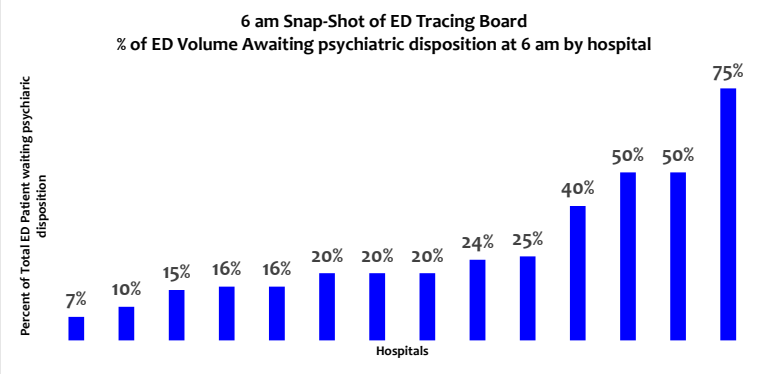
- Average LOS **5.9** hours
- Maximum LOS **29** DAYS!
- ED ~~Boarding~~ **Living**



21

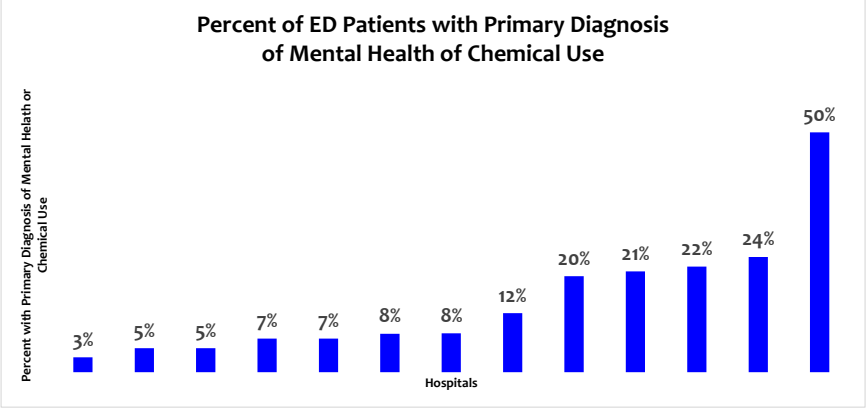
Percent of Total ED Volume awaiting psychiatric disposition at 6 am

- Psychiatric Boarding, **28%** of ED Volume at 6 am



22

% Patients with Mental Health or Chemical Use



23

Psychiatric Questions

- Psychiatric designated area in the ED
  - **8** YES
- Psychiatric holding orders by ED physicians
  - **9** YES (up from 7 in 2017)
- Psychiatrists rounds on patients in the ED (not all patients)
  - **13** YES

Advice

If you have psychiatric boarding you should
1. create designated area
2. Have automatic orders for
   a. Psychiatric meds
   b. Routine meds (HTN, DM, Asthma)
3. Make patients ambulate

24

Staffing

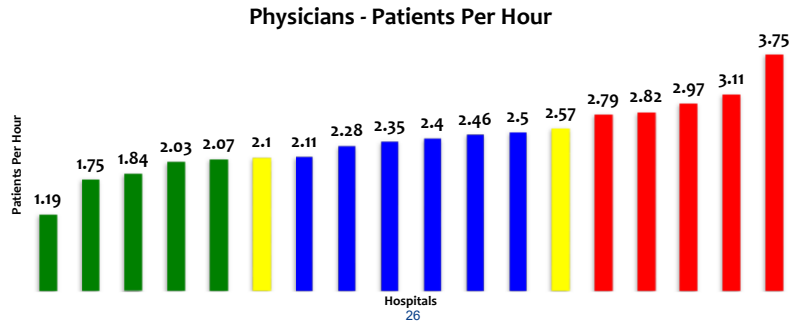
- Patients Per Hour = Scheduled staff hours per day/ Patients per day
- Highest Physician PPH = highest NP hours
- Does NOT correlate with length of stay/ efficiency

	Physicians	Nurses	Techs + Clerks	Physicians Extenders/ Residents
EDBA 2016	2.3	0.6	1.5	2.9
San Diego	1.22 - 3.76	0.21 - 0.76	0.62 - 12.4	0 – 59 hours

25

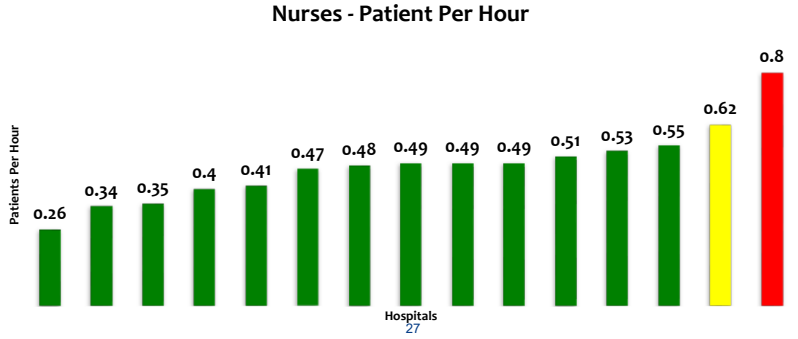
Physicians Patients Per Hour

- High Number = Working hard
- Low Number = Easy shift
- Yellow = EDBA average = **2.1** with extended providers; **2.57** without
- San Diego Average = **2.4**



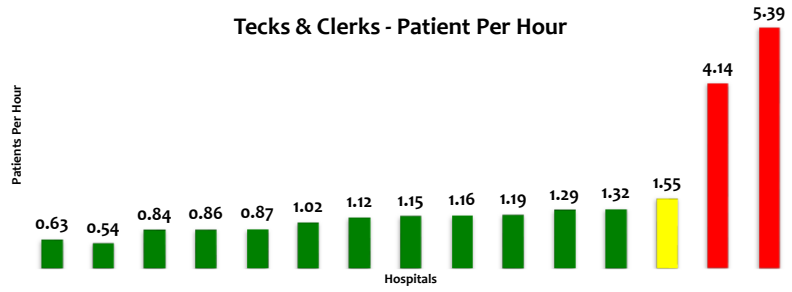
Nurses Patient Per Hour

- High Number = Working hard
- Low Number = Easy shift
- Yellow = EDBA average, **0.62**
- San Diego Average = **0.48,** ….San Diego nurses have it better



Techs/Clerks Patients Per Hour

- High Number = Working hard
- Low Number = Easy shift
- Yellow = EDBA average, **1.55**
- San Diego Average = **1.54**



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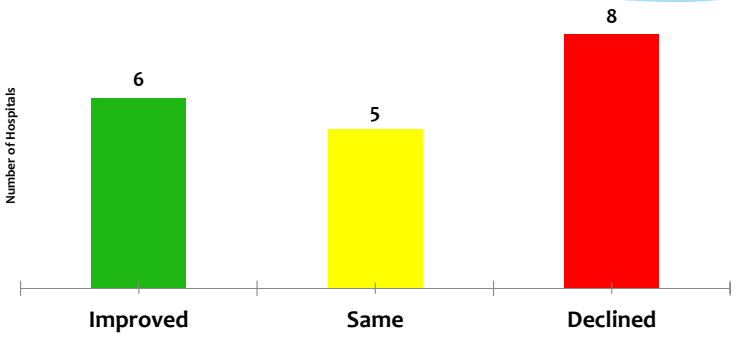
Diagnostic Testing

- Tests per 100 patients = Total Annual Tests/Total Annual Visits*100
- 13 Hospitals Reporting
- EDBA: 46% of patients receive imaging,
  15.4% receive CT scans, of those 50% are head CT
- EDBA CT average for trauma centers = **29** (21 non Trauma centers)
- Lowest EKG = Children's

	EKG	XRAY	CT	MRI	Ultrasound
EDBA 2016	25	42	21	1.1	5.7
San Diego Average	29	42	25	3	15
San Diego Range	4.8 - 47	5 - 67	3- 51	0.07 – 10.2	2.4 - 91

29

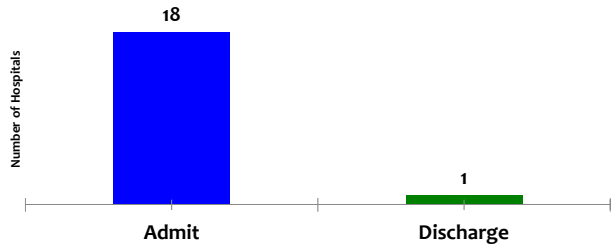
What happened to ED throughput over the past year?



30

What is the greater problem: Admitted or Discharged Patients?

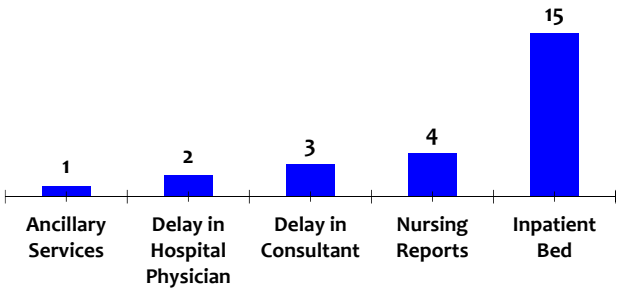
- Admitted Patients are Greater Barrier to Throughput
- Same majority answer for 13 years of survey



31

Biggest Obstacle for Length of Stay of Admitted Patients

- Greatest Concern = Inpatient Bed Not Available
- Inpatient beds – due to nursing staff or physical beds



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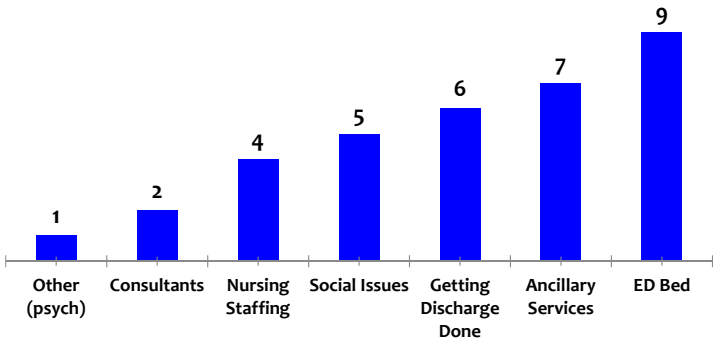
Biggest Obstacle for Length of Stay of Discharged Patients

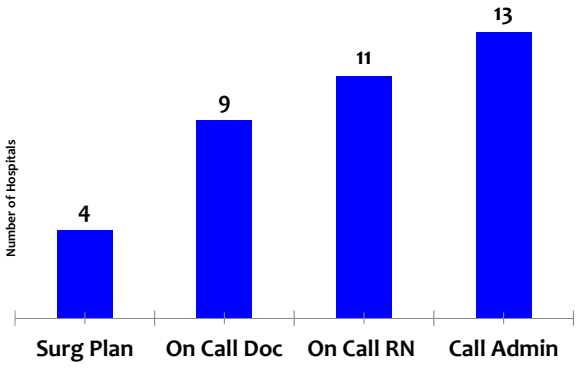
- May select more than one answer
- Answers may change based on who is answered the question



33

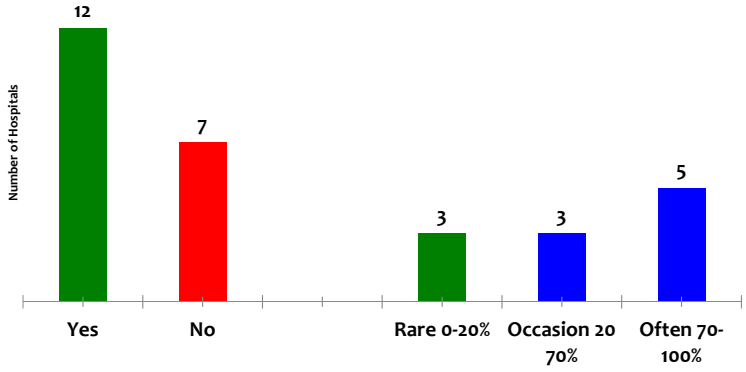
What do you do for surge capacity?

- May select more than one answer
- Capacity plans and direct admissions mentioned



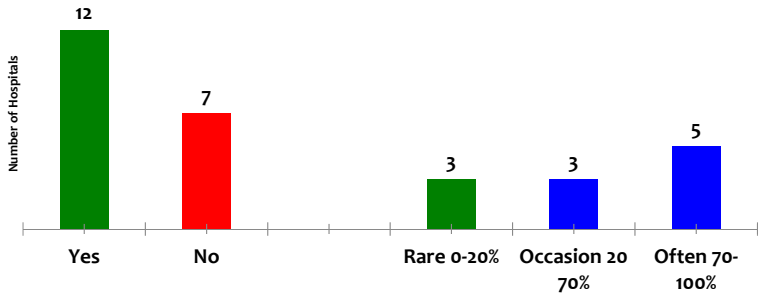
34

Do you do orders from triage?



35

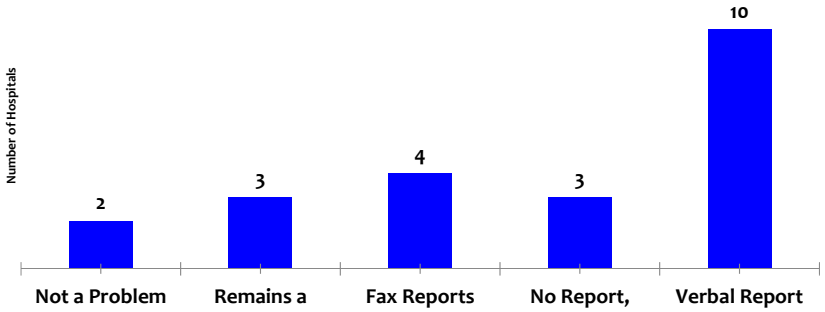
Advanced Practitioner or Physician in Triage?



36

How do you deal with delays of moving admitted patients due to Nursing Reports?

- 2 hospitals state not a problem: Sharp Memorial, Scripps Encinitas (physicians answering survey)



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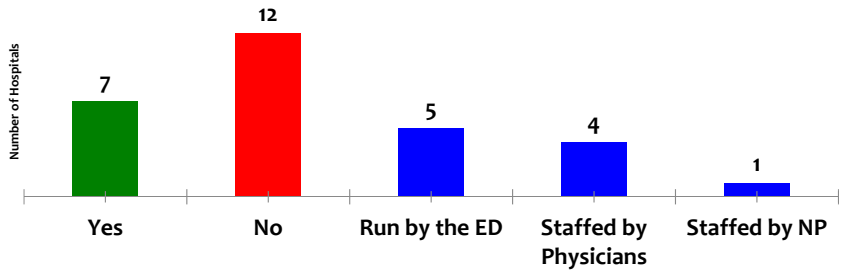
Observation Units

- 7 EDs have observation units
  - 5 EDs run their own units: Kaiser, Paradise Valley, Scripps Memorial, UCSD – both campuses



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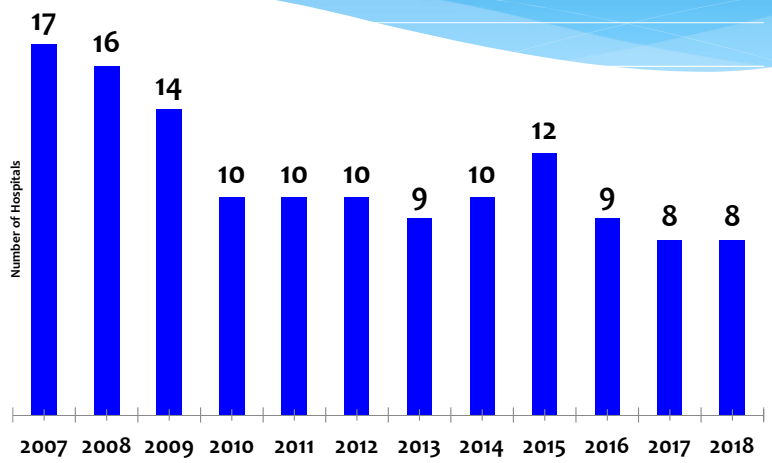
On Call Trends – Number of hospitals reporting On Call physician specialty deficiencies



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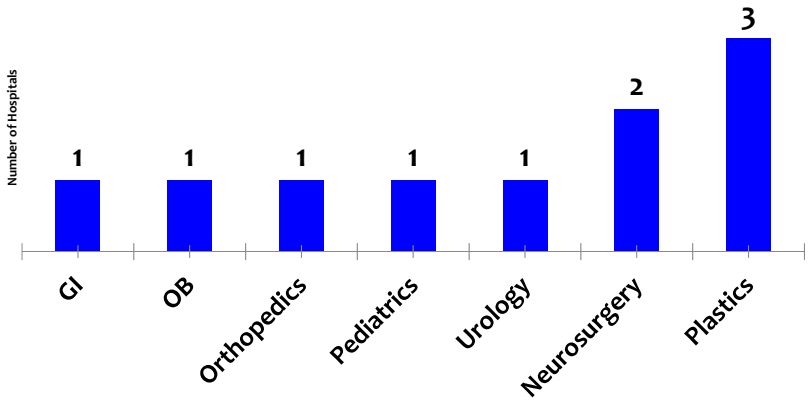
On Call Deficiencies –
Specialties in demand

- ENT # 1 past few years
- Less specialties affected



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Disaster Training

How many physicians participate in disaster drills?

- Range: **2** doctors – **100%**

How many nurses participate in disaster drills?

- **2** nurses – **100%** of nurses

Hospitals with 15 or more physician/ nurse participation in disaster drills:

- Navy, Scripps Encinitas, UC Health, El Centro, Kaiser, Pomerado, Palomar

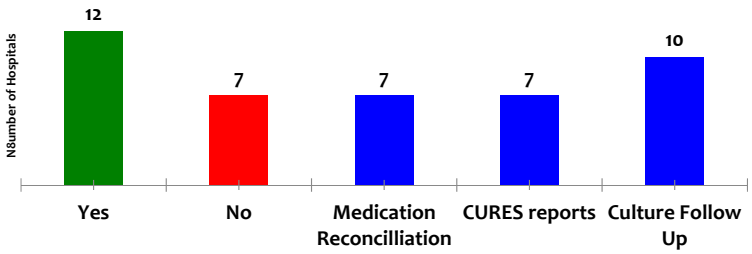
41

Pharmacists in the ED

- It is standard of care that larger EDs have pharmacists
- 1 – 3 FTEs

Advice

1. Larger volume EDs should have ED pharmacists
2. ED pharmacist should assist with culture follow up, CURES, medication reconciliation



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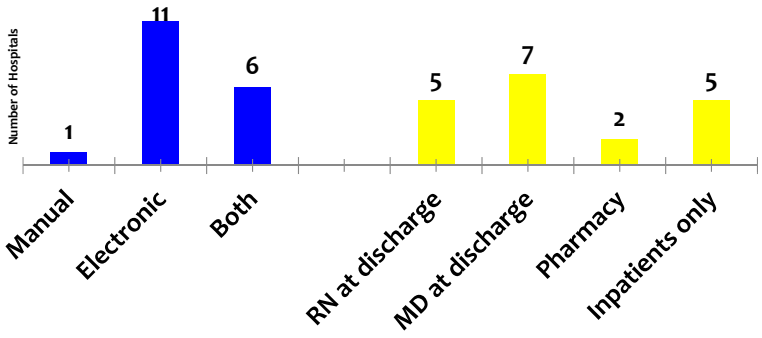
Medication Reconciliation

- Most Hospitals do medication reconciliation electronically
- Methodology all over the place



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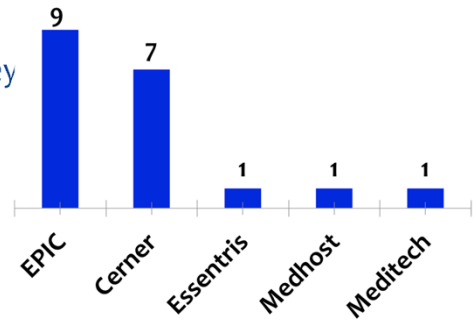
Computer Systems

- EPIC = Kaiser, Rady Children's, UC Healthcare, Scripps, Alvarado
- Cerner = Sharp, Palomar/Pomerado, Tri-City
- Essentris = Naval
- Meditech = Paradise Valley
- Medhost = El Centro



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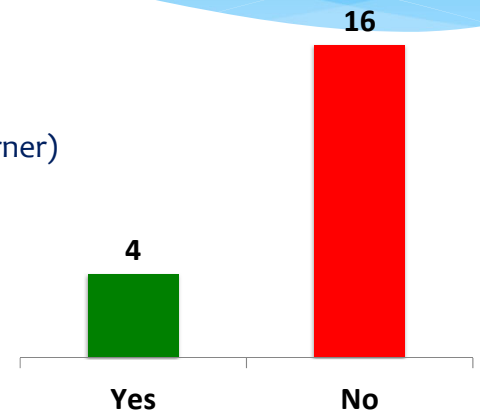
Scribes

- Palomar (Cerner)
- Pomerado (Cerner)
- El Centro (Medhost)
- Sharp Chula Vista (Cerner)



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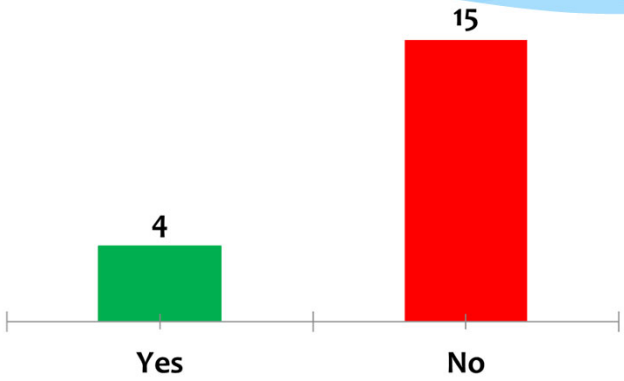
Do you use HIE, San Diego Health Information Exchange?



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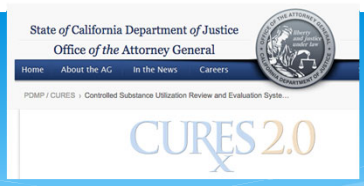
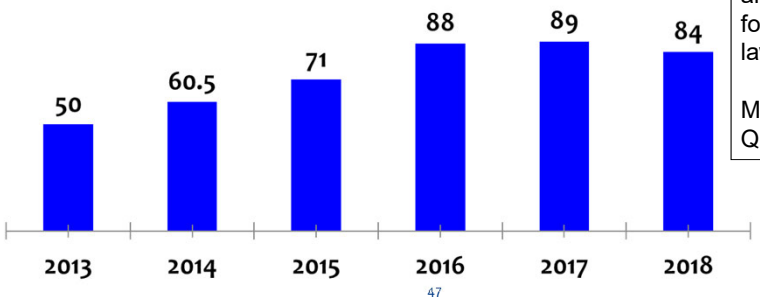
CURES registration



- What percentage of your physicians are enrolled in CURES? (Mandatory as of June 2016)
  - **100% - except for Navy and Children's and 2 other**

Advice
If you are not at 100% you are not following the law

Make this a QI project



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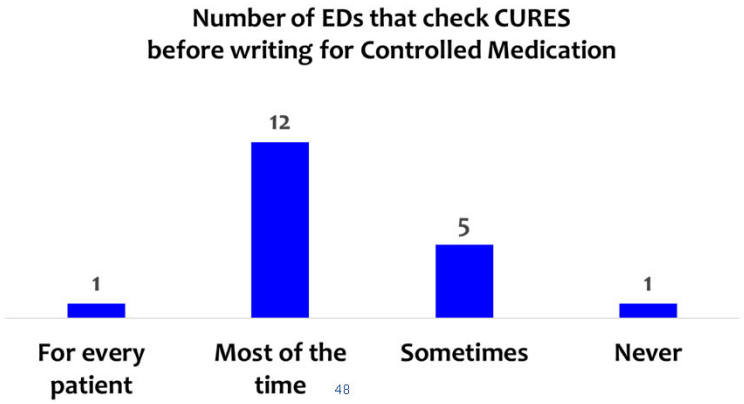
How Often Do You Check CURES?

- Many patients who die from prescriptions visit an ED before they die



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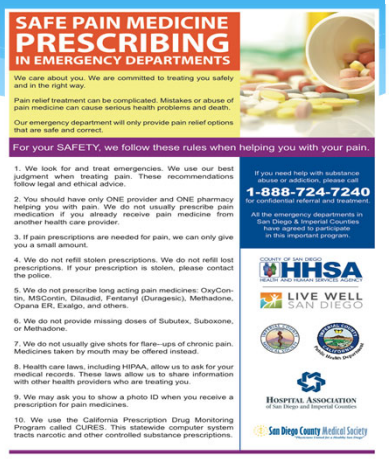
ED Safe Prescribing Guidelines

- EDs reported familiarity with guidelines – **100% in 2017, 90% 2018**
- Physicians following guidelines
- Handout Given to
  - 100% of patients – 2 hospitals
  - Selected Patients – 9
  - Some Patients - 3
  - Not Using – 3


SAFE PAIN MEDICINE PRESCRIBING IN EMERGENCY DEPARTMENTS

We care about you. We are committed to treating you safely and in the right way.

Pain relief treatment can be complicated. Mistakes or abuse of pain medicine can cause serious health problems and death.

Our emergency department will only provide pain relief options that are safe and correct.

For your SAFETY, we follow these rules when helping you with your pain.

1. We look for and treat emergencies. We use our best judgment when treating pain. These recommendations follow legal and ethical advice.
2. You should have only ONE provider and ONE pharmacy helping you with pain. We do not usually prescribe pain medication if you already receive pain medicine from another health care provider.
3. If pain prescriptions are needed for pain, we can only give you a small amount.
4. We do not refill stolen prescriptions. We do not refill lost prescriptions. If your prescription is stolen, please contact the police.
5. We do not prescribe long acting pain medicines: OxyContin, MSContin, Dilaudid, Fentanyl (Duragesic), Methadone, Opana ER, Exalgo, and others.
6. We do not provide missing doses of Subutex, Suboxone, or Methadone.
7. We do not usually give shots for flare–ups of chronic pain. Medicines taken by mouth may be offered instead.
8. Health care laws, including HIPAA, allow us to ask for your medical records. These laws allow us to share information with other health providers who are treating you.
9. We may ask you to show a photo ID when you receive a prescription for pain medicines.
10. We use the California Prescription Drug Monitoring Program called CURES. This statewide computer system tracts narcotic and other controlled substance prescriptions.

If you need help with substance abuse or addiction, please call 1-888-724-7240 for confidential referral and treatment.

All the emergency departments in San Diego & Imperial Counties have agreed to participate in this important program.

COUNTY OF SAN DIEGO HHSA HEALTH AND HUMAN SERVICES AGENCY
LIVE WELL SAN DIEGO
HOSPITAL ASSOCIATION of San Diego and Imperial Counties
San Diego County Medical Society

49

Since using Safe Prescribing Guidelines

- We See Less Chronic Patients - **8 out of 16**
- We spend less time with each chronic pain patient – **7**
- The interaction with chronic pain patients is easier – **9**
- We write for significantly less opioid prescriptions – **12**
- It is still difficult to say no to opioid prescriptions – **5**

5year results
- Marked improvement of improved conversation about pain
- More report less prescriptions
- EDs that don't use guidelines or check CURES report difficult with saying no to patients.

50

One San Diego Vision for Safe Prescribing

- One Provider, One Pharmacist
- Use CURES
- Medication Agreement
- No Opioid + Benzodiazepines
- Honor ED Guidelines
- Naloxone

15 EDs familiar

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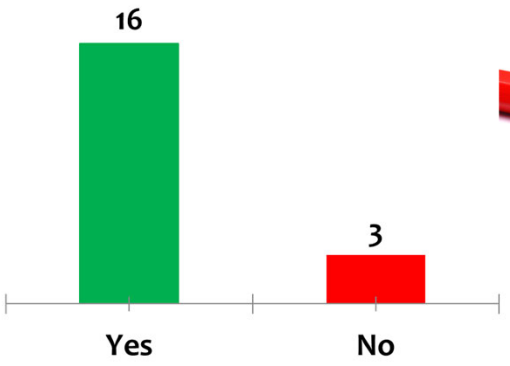
Do you think Patient Satisfaction scores are a deterrent for some physicians to say NO to giving patients prescriptions they demand?



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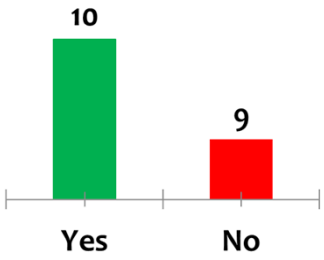
Do you prescribe Naloxone for patients who overdose on opioids or heroin?

- 2016 CDC Guidelines: Naloxone to anyone taking over 50 morphine equivalents per day; also if Opioid + Benzodiazepine combo
- California Law: Pharmacist is able to dispense without a prescription
- Medi-Cal carve out medication

50 MME	
Hydrocodone 5	10 tablets
Hydrocodone 10	5 tablets
Oxycodone 5	6 tables (33 mg)
Oxycodone 15 mg ER	2 tablets
Methadone 5 mg	2 tablets (12mg)
Tramadol 50 mg	10 tablets



Advice
Prescribe Naran Nasal Spray 4 mg/0.1 , call 911 apply to nostril prn opioid overdose, may repeat in 3 minutes in not awake

53

Medication Assisted Treatment

- How many of the ED physicians have an X Waiver for Suboxone?
  - **3 total in San Diego**
- Does your ED have a partnership with MAT (medication assisted treatment) program? **3 Yes, 16 No**
- Do you have SBRIT (Screening and Brief Intervention Treatment)?
  - **1 Yes, 18 No**
- Would you consider calling Public Health after an opioid overdose?
  - **12 Yes, 6 No**

54

EMS Questions

How Often Do You View EMS Records?

- Never, Almost Never 2
- Occasionally 2
- Sometimes 1
- Frequently 4
- Always 7

55

EMS Questions

What Keeps you from viewing EMS Records?

- **Not Available when I need them 12**
- Not Accurate 1
- Not Comprehensive 1
- Doesn't Have the Information I need 2
- Too Hard To Find The Information I need 6
- Don't Have the Time 0
- Not a Problem, I Always Check 2

56

EMS Questions

- Do you find MICN information useful?
  - 15 Yes; 3 No
- Do you find MICU information accurate?
  - 17 Yes; 1 No
- Would you prefer to get report directly from EMS rather than MICN?
  - 14 Yes; 4 No

57

EMS Questions

- Does your department allow shared information with EMS?
  - **4 Yes; 3 No; 10 I Don't Know**
- Would you prefer Children's Hospital run pediatric EMS calls? (for Base Stations)
  - **9 Yes, 100%** base stations who answered the question
- Do your physicians feel confident that they are up to date on EMS protocols and recent literature? (For Base Stations)
  - **12 Yes; 5 Yes,** but not perfect; **0 No**

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EMS Questions

What information would you or your staff like to see in MICN reports ?

- Age 18
- Sex 18
- Chief Complaint 18
- Unit Number 6
- ETA 12
- Treatment Provided 16
- Medical History 16
- Allergies 11
- Description of Seizure 14
- Acuity 14
- Location of where the patient was found 15
- Who called 911 13

59

Drug Shortages

- Lidocaine x 3
- Morphine x 2
- Dilaudid
- Opioids x 5
- Antibiotics x 4
- Unasyn
- Fluorescein Strips x 3
- Hydralazine x 2
- Normal Saline
- Ketamine
- Valium
- Inapsine
- A bunch
- Varies
- Military same as civilian

60

Sexual Assault

- Where you aware that lidocaine may interfere with sexual assault prosecution? That is why it is recommended that Rocephin given to potential rape victim be given without lidocaine.
  - 3 Yes, 16 No
- Did you know that SART recommendations are on the EMOC web site?
  - 9 Yes, 10 No

61

Law Enforcement

- Do you make copies of pertinent medical records for jail medical staff when discharging a patient from the ED to Jail?
  - **13 Yes, 4 No, 2 No-but will start**
- Did you know that law enforcement decides whether to stay with the patient in the ED after an alleged crime based on the estimated time the patient will be in the ED and the alleged type of crime? **13 Yes, 6 No**
- Do you give law enforcement a time estimate of how long the patient work up will take when they are waiting with a patient?
  - **14 Yes, 4 No, 1 No, but will start**
- Did you know EMOC web site has information on jail clearance and law enforcement communication?
  - **8 Yes; 11 No, but we know now**

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SDCMS.ORG
Search: Emergency Medicine Oversight Commission

- Annual Survey
- Safe Prescribing Guidelines
- ETT Paramedic Turnover Agreement
- Strangulation Education
- Jail Information Sheet
- Violence in the ED
- Law Enforcement Sheet
- SART Guidelines
- 5150 Information

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Thank You Thank You Thank You
For Making
This Data Possible

RESEARCH
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Using Data To Drive Emergency Department Design: A Metasynthesis

Shari J. Welch, MD

Abstract

Objective: There has been an uptick in the field of emergency department (ED) operations research and data gathering, both published and unpublished. This new information has implications for ED design. The specialty suffers from an inability to have these innovations reach frontline practitioners, let alone design professionals and architects. This paper is an attempt to synthesize for design professionals the growing data regarding ED operations.

Methods: The following sources were used to capture and summarize the research and data collections available regarding ED operations: the Emergency Department Benchmarking Alliance database; a literature search using both PubMed and Google Scholar search engines; and data presented at conferences and proceedings.

Results: Critical information that affects ED design strategies is summarized, organized, and presented. Data suggest an optimal size for ED functional units. The now-recognized arrival and census curves for the ED suggest a department that expands and contracts in response to changing census. Operational improvements have been clearly identified and are grouped into three categories: input, throughput, and outflow. Applications of this information are suggested.

Conclusion: The sentinel premise of this meta-synthesis is that data derived from improvement work in the area of ED operations has applications for ED design. EDs can optimize their functioning by marrying good processes and operations to good design. This review paper is an attempt to bring this new information to the attention of the multidisciplinary team of architects, designers, and clinicians.

Key Words: *Emergency department, emergency department operations, triage, throughput, design, efficiency, quality, safety*

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Aim of This Paper

The universe of emergency department (ED) operations has seen an uptick in innovations in the past two decades (Beach, Haley, Adams, & Zwemer, 2003; Bertoty, Kuszajewski, & Marsh, 2007; Chan, Killeen, Kelly, & Guss, 2005; Choi, Wong, & Lau, 2006; Gorelick, Yen, & Yun, 2005; Richards, Navarro, & Derlet, 2000; Spaite et al., 2002; Thompson, Yarnold, Williams, & Adams, 1996; Welch, 2010a; Wiler et al., 2010). These innovations have important implications for the way EDs are designed and how operations

and processes are married to design. This paper is an attempt to synthesize for design professionals the growing data, published and unpublished, regarding ED operations and to suggest applications for ED design.

Background

From 1995 to 2005 the number of ED visits increased nearly 20% to 115.3 million, even though the number of hospitals decreased by nearly 10% (Nawar, Niska, & Xu, 2007). The American Hospital Association (2005) reports that 69% of urban EDs are over capacity, resulting in crowded conditions and ambulance diversions. In 2005 the Joint Commission implemented a new leadership standard regarding the management of patient flow, which mandated that hospitals "...develop and implement plans to identify and mitigate impediments to efficient patient flow throughout the hospital" (Joint Commission, 2005).

The valuable effect on patient outcomes of streamlining ED operations has been emphasized by the Agency for Healthcare Research and Quality (AHRQ), the Institute for Healthcare Improvement, and the Institute of Medicine. Research demonstrating the impact of ED efficiency on subsequent outcomes for a number of clinical entities has been accumulating (Bernstein et al., 2009; Fee, Weber, Maak, & Bacchetti, 2007; Joint Commission, 2002; Magid et al., 2009; Pines & Hollander, 2008; Richardson, 2006; Sprivulis, Da Silva, Jacobs, Frazer, & Jelinek, 2006).

Changing demographics affect the way EDs operate. As patients age, the complexity of their acute health care needs increases (Sprivulis, 2004). As the Baby Boomers reach their senior years, they will hit the ED like a tidal wave. The sheer amount of information, diagnostic and therapeutic tasks, and personnel involved in caring for these complex patients will make it necessary to change space, processes, and operations in the ED.

The most common complaint about visits to the ED is the perception that everything takes too much time (Press Ganey Associates, 2009). From the patient's perspective, an ED visit is a series of seemingly random queues without clear communication about what the patient is waiting for, what the next step in the process will be, and how long that step will take. The waiting has no value to the patient. Emergency care providers often offer the excuse that patient demands are "unpredictable" and that the sickest patients must be treated first. Although both of these statements are founded in truth, the demands on the ED are much more predictable than practitioners are often willing to admit.

Most hospitals are capable of providing timely care for the sickest patients without delaying service for low-acuity patients. The key is using data-driven process improvements to expedite care.

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service for low-acuity patients. The key is using data-driven process improvements to expedite care.

ED operations research is often slow to reach the front lines. To date there is no journal for ED operations and there is frequently a significant delay between operational innovation and widespread frontline acceptance (Welch, 2010a). Every day, emergency physicians, nurses, and staff innovate to improve ED processes. The 4,500 EDs in the United States are living laboratories, and each one is trying to solve logistical and operational challenges (typically constrained by physical space limitations). When ingenious local solutions are achieved, timely and widespread dissemination of these ideas fails to occur; mechanisms for the diffusion of innovation are lacking. The specialty suffers from an inability to have these innovations reach front-line practitioners let alone design professionals and architects. The result is a knowledge-action gap in ED operational innovation.

The sentinel premise of this metasynthesis is that data from improvement work in the area of ED operations have applications for ED design.

EDs can optimize their functioning by marrying good processes to good design.

EDs can optimize their functioning by marrying good processes and operations to good design.

Measures of ED Performance

A number of metrics appear in the emergency medicine literature and are used by healthcare leaders as markers for quality and performance (Welch, 2010a; Welch et al., 2011). The time interval metrics are better understood when referring to this chart, which depicts the time stamps/time intervals of a typical ED stay (Figure 1). In addition, a number of measures reported as percentages or rates have been used to capture elements of performance in the ED.

Time Metrics (Time Intervals)

- **Arrival-to-provider time** (a.k.a. "door-to-doc time"): Arrival time to provider contact time.
- **ED length of stay (LOS):** Arrival time to departure time.

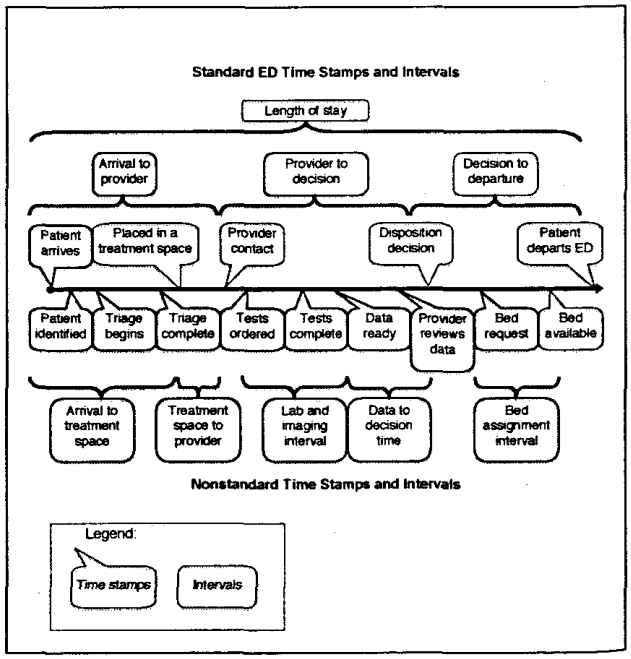

Figure 1. Timeline of Emergency Department time stamps and intervals.

Table 1. ED Performance as a Function of Size

	Under20k (*n* = 64)	20K to 40K (*n* = 146)	40K to 60K (*n* = 92)	60K to 80K (*n* = 35)	Over 80K EDs (*n* = 22)	*p*-value
Performance Metrics						
Left before treatment complete (%)	1.37	2.10	2.82	3.34	3.59	< 0.0001**
Door-to-physician time (in minutes)	24	27.5	30.5	36.5	36.5	0.0012*
Median ED LOS for admitted patients (in minutes)	207	246	306.5	312.0	347.5	< 0.0001*
Median ED overall LOS (in minutes)	125	148.5	174.0	183.0	203.0	< 0.0001*

*Wilcoxon rank sum test
**ANOVA

Proportion Metrics

- **Left without being seen (LWBS):** All patients who leave the ED before being seen by a provider.
- **Left before treatment complete (LBTC):** All patients who leave the ED before formal disposition is made.
- **Complaint ratio:** All spontaneous written, phone call, or spoken expressions of concern brought to the attention of ED management or hospital staff. By convention, complaint ratios are tracked as complaints per 1,000 ED visits.

Patient Satisfaction

- **Patient and staff satisfaction surveys:** Although typically done using local survey instruments, Press Ganey or other professional patient survey companies may administer these. They are usually reported as percentiles.

Size (Annual Volume) Matters

Unpublished but credible data from the Emergency Department Benchmarking Alliance (EDBA) suggests that the size (which, in ED operations, typically refers to annual volume) correlates with performance on metrics. EDBA is a consortium of 486 performance-driven American EDs. It has been collecting performance and operational data on EDs for 7 years through its annual mandatory data survey. Data from the EDBA reveal that performance on metrics is volume dependent—the smaller, lower-volume EDs are operationally more efficient and perform better on metrics, suggesting that there may be an optimal size for functional units in the ED (see Table 1) (Augustine, 2011a). These performance data are in keeping with a 2010 Canadian study that also found that lower-volume departments functioned more efficiently (Hutten-Czapski, 2010).

In addition, EDBA data suggest that a new ED be built with the assumption that approximately 1,500 patients a year could be treated in each patient treatment room, in keeping with recom-

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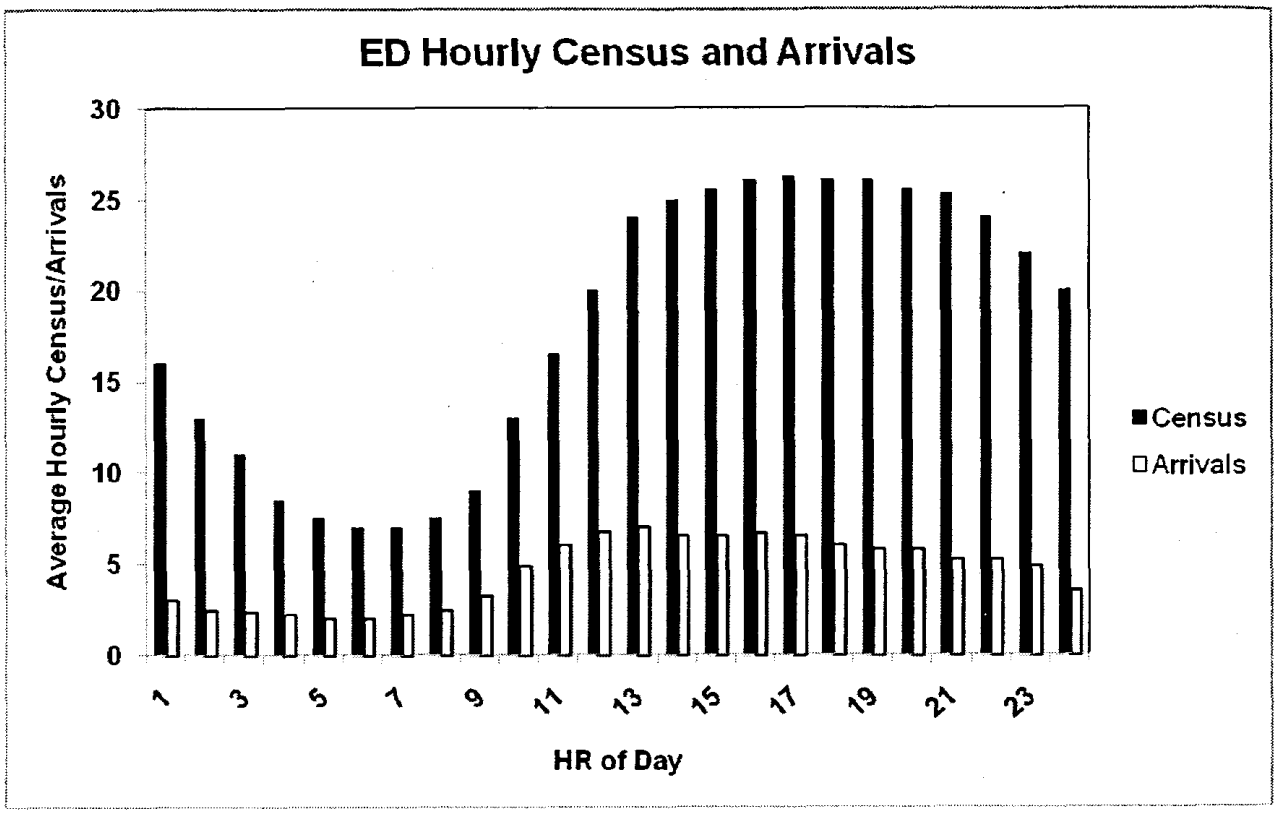

Figure 2. Census and arrival curve of the Emergency Department.

mendations put forth by Huddy (2006).

The Breathing Emergency Department

It is well recognized that the workload in an ED is not level throughout the day. The ED goes through a 24-hour cycle that is predictable regardless of volume (Welch, Jones, & Allen, 2007). The census in an ED, regardless of size, is typically three to four times as great at 4 p.m. as the census at 4 a.m. (Figure 2). This means that the ED space and operations must be able to flex up and down to meet this extreme variation in census and arrivals throughout the day.

Applications to Design

The EDBA data showing that lower-volume EDs are more efficient could suggest an optimal size for functional units in an ED, even if the overall department must have many more beds. Knowing from EDBA data that EDs seeing 20,000 or fewer annual visits are the most efficient (according to standard performance metrics) and that departments can anticipate 1,500 visits per bed per year, the performance-driven ED might have no more than 13 beds in a functional unit. To be sure, these relationships are not fully understood, but they do suggest that economies of scale are not seen in EDs; in that world, bigger is not necessarily better. The data are not definitive in terms of functional unit size, but they suggest a place to start.

It may be that the higher-volume ED is simply trying to manage so many patients and tasks and

so much information that systems and processes break down. Therefore, designing smaller functional units within a larger department may be a design strategy whose time has come. A functional unit requires a place for physicians and nurses to work, a place for the health unit clerk, space for the management of lab specimens, a portal for the tube system, a medication room, a space for imaging study results (a viewing area for hard copies to be reviewed—or more commonly in 2011, a digital radiography station), and both clean and dirty utility rooms.

Should functional units be equivalent and act as multiple smaller EDs or should they be chief complaint or acuity differentiated? The uncontestable amount of research around the efficacy of the fast track would suggest that patient segmentation based on acuity and creating functional units or zones for patients with similar acuities may be superior to creating zones that are small ED equivalents (Cooke, Wilson, & Pearson, 2002; Hampers, Cha, Gutglass, Binns, & Krug, 1999; Handel et al., 2011; O'Brien, Williams, Blondell, & Jelinek, 2006; Oredsson et al, 2011). Although the definitive data on this have not been gathered, higher-volume EDs are gravitating toward increasing patient segmentation and differentiation of the functional zones (discussed in more detail later).

In response to increasing volume, EDs are being built with increasing numbers of beds. However, often little attention is paid to how workflow will be adapted to the larger footprint. But combine the idea that the ED footprint should change in a 24-hour cycle with the concept of smaller operating zones and a new notion is born:

***The cyclical daily opening and closing of functional units according to patient arrivals creates the* Breathing ED.**

The cyclical opening and closing of functional units according to patient arrivals creates the *Breathing ED*. The University of Iowa, a 52,000-volume ED and Level I trauma and teaching hospital in Iowa City, Iowa (which was redesigned in conjunction with Lean applications to its ED processes), the Coxhealth ED in Springfield, Missouri, and the University of Kentucky Chandler ED in Lexington, Kentucky, also a Level I trauma center and teaching hospital that has 55,000 visits annually (and is part of the Pebble Project), are recent examples of EDs designed to be Breathing EDs (Dickson, Singh, Cheung, Wyatt, & Nugent, 2009).

As the daily surge of patient arrivals begins, the ED opens up new functional care units. The department is designed to accommodate the flow model used by the department and in accordance with the community's needs. For instance, the fast-track lower-acuity unit is seldom open for 24 hours a day, even in high-volume EDs. The University of Iowa operates its pediatric ED and fast track out of the same functional unit and space from late morning until midnight and then closes the area down. Contrarily, departments

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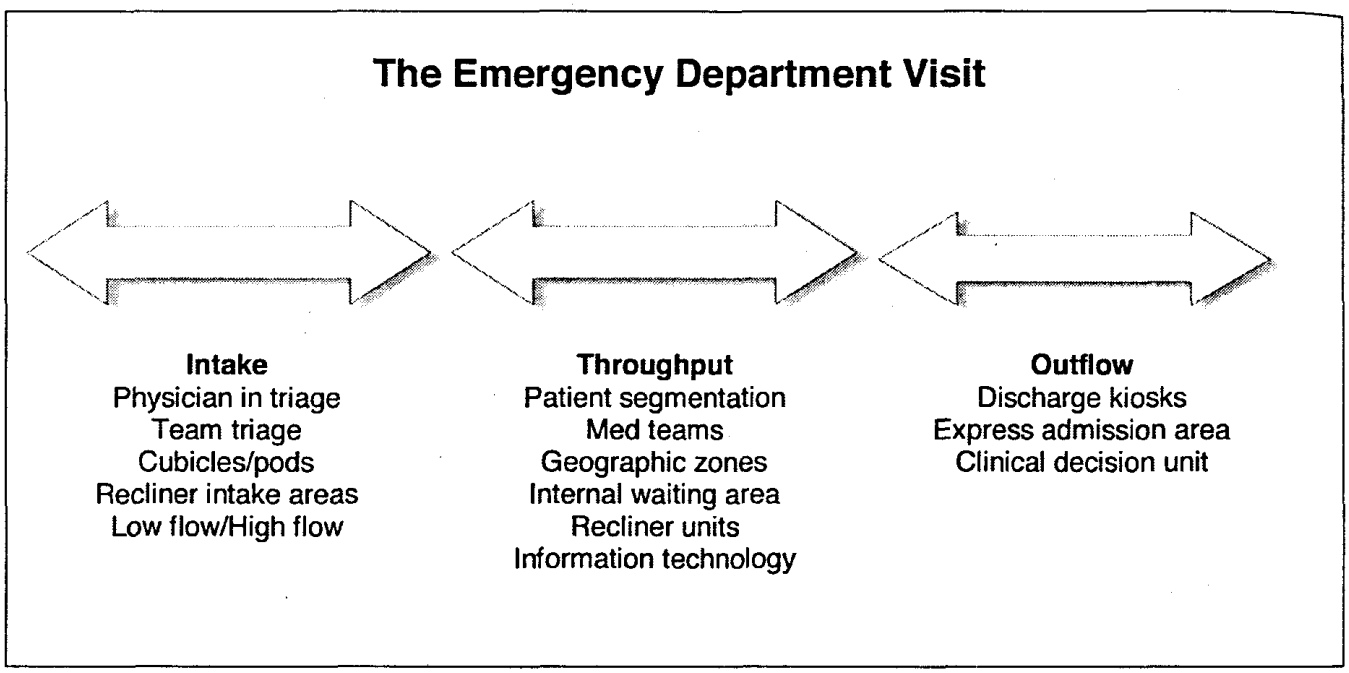

Figure 3. Emergency Department operational innovations.

serving high numbers of seniors often maintain one functional unit for longer periods of observation. Most clinical decision and observation units are open 24 hours and part of the "core" that is always open and staffed.

Operational Research

This review uses the intake-throughput-outflow model to organize and present the innovations being tested around the country (Figure 3). Most of the operational research done in emergency medicine has focused on patient intake (also known as the *front end*) because improvements in the intake process can have a dramatic and immediate impact on patient satisfaction, door-to-physician times, and LWBS (Welch & Davidson, 2010). There is added impetus to focus on the *front end* because the Centers for Medicare & Medicaid Services (CMS) has announced that two of the five operational metrics it is expecting to incorporate into its value-based purchase model of payment are arrival-to-provider time and LWBS, markers for intake performance (National Quality Forum, 2008).

Improvements at Intake

A first step in decreasing waiting times is to create an ED intake process that assesses patients efficiently and sends them to the appropriate area within the department.

Physician in Triage

One of the most common areas of operational innovation, both published and unpublished, involves moving away from the traditional nurse triage model that has dominated intake into the ED for more than 30 years. Recent research has shown that traditional nurse triage, as currently practiced, fails to treat the sickest patients according to recommended time frame guidelines and

creates a bottleneck in the beginning of the ED visit (Weber, McAlpine, & Grimes, 2011; Welch & Davidson, 2011).

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Newer intake models now put a physician, either alone or as part of a team, at the front of the ED visit—at intake. The literature shows that a physician assessment is more reliable than assessments by providers with less training (Dent, Weiland, Vallender, & Oettel, 2007; Kosowsky, Shindel, Liu, Hamilton, & Pancioli, 2001; Levine et al., 2006; Rocker et al., 2004; Rodriguez, Wang, & Pearl, 1997; Sinuff et al., 2006). Using an experienced physician in triage allows many patients to be sent home with little or no testing (Sen et al., 2011; Terris, Leman, O'Connor, & Wood, 2004). It reduces the arrival-to-provider time, the overall LOS, and the LWBS rate and increases both patient and staff satisfaction with the process (Choi, Wong, & Lau, 2006; Holroyd et al., 2007; Partovi, Nelson, Bryan, & Walsh, 2001; Rogers, Ross, & Spooner, 2004; Travers & Lee, 2006). There are many variations of the physician-in-triage model. Typically a lone physician in triage will do an abbreviated assessment and send the patient to the appropriate area in the department for further diagnostic or therapeutic interventions, or for discharge processing.

Team Triage

More detailed intake assessments are performed using a team triage model (Chan et al., 2005; Mayer, 2005; McD Taylor, Bennett, & Cameron, 2004; Richardson, Braitberg, & Yeoh, 2004; Subash, Dunn, McNicholl, & Marlow, 2004). In this model, the team might consist of a combination of the following: physician, nurse, midlevel provider, laboratory technician, ED technician, and scribe. In this model, more diagnostic and therapeutic work is performed during the intake encounter.

Pods and Zones

Some centers have begun reporting the implementation of changes to the physical space to accommodate new intake models through case reports. Though not yet published in peer-reviewed journals, the data from these reports are compelling. At Arrowhead Regional Medical Center in Colton, California, the ED volume more than doubled from 50,000 visits to 110,000 visits in 5 years. The LWBS rate had risen to an astounding 20%, and arrival-to-provider time was a dangerous 4 hours. In desperation the staff trialed a physician-in-triage model made possible by bringing in furniture modules that created small cubicles in which physicians can see patients.

Their experience revealed that 50% of patients could be discharged right from the cubicle. This opened up beds and resulted in an unexpected

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reduction in nurse staffing. Their LWBS rate dropped to 1% and their arrival-to-provider time was reduced to 31 minutes (Welch & Davidson, 2010). At Methodist Sacramento Hospital, in Sacramento, California, the ED was grossly under-bedded seeing 42,000 annual visits in a 19-bed ED. The staff took a different approach to the space and layout to allow a physician and nurse to be present at intake.

The staff created a six-bed *triage pod,* occupied by contiguous stretchers with curtains. This operational model articulated a goal that patients spend less than 15 minutes in the triage pod before being moved elsewhere in the department. The physician traverses the pod and after a quick assessment transfers the patient to one of three areas: the waiting room, the main ED, or a monitored higher-acuity ED bed.

Although the department shrank from 19 to 13 beds, with new processes in place they believe they have smarter bed utilization. Methodist has seen their LWBS rates drop from 5% to 1% (Augustine, 2011a). In Gaston Memorial Hospital in Gastonia, North Carolina, $800 was spent to create a *care initiation area* (also called the CIA) with a physician and team in triage. By changing the space and the process, this 80,000-visit ED saw its LWBS rates fall from 12% to 1.3%, and its Press Ganey patient satisfaction scores rose to the 99th percentile (Besson, 2009).

Recliner Intake

In another case study in Carolinas Medical Center in Charlotte, North Carolina, the ED team redesigned its intake area, putting recliners and supplies within reach of the physician and team. Like Arrowhead, they found that the physician could discharge 45.5% of patients from triage. This is an effective way to off-load the main department when it is over capacity. This Level I trauma center, which sees an annual ED volume of 115,000 visits, has seen improvement in arrival-to-provider time, decreased LWBS rates, and an overall decrease in LOS in these trials (Welch & Savitz, 2011).

Low-Flow/High-Flow

Another new intake model as yet unpublished but presented at an AHRQ-sponsored summit involves the use of two distinct processes for intake, depending on the census in the department and the rate of arrivals. Thomas Jefferson University in Philadephia, Pennsylvania, a busy urban teaching hospital with an annual volume of 85,000, dubbed this model the *low-flow/high-flow* process model. When the ED is at a low census with open beds, the process is the same as that employed in most traditionally run EDs. Patients are triaged in the traditional manner, and each patient occupies a room after triage. As the ED reaches capacity, the department shifts into the high-flow process. In this model, a processing area is opened and a team using protocol-guided treatment plans begins the intake process and patient workups there. The first pilot of the new low-flow/high-flow model showed a decreased LOS from 653 minutes to 158 minutes. Exit surveys of patients involved in the pilot showed extremely high patient satisfaction scores: 4.5 on a scale of 5 for extreme satisfaction (Welch & Savitz, 2011).

Applications to Design

First, the design of the intake area will depend on the process the clinicians intend to use. For very rapid physician assessments, a pod design or a bay with multiple treatment spaces that feeds other ED areas may be appropriate. Data about annual volume, admission rates, acuity, and the age of the patient populations served would inform decisions about intake models. Recliners could replace either chairs or stretchers for the first leg of the ED journey.

The big operational change of putting a physician at the front of the ED visit needs translation into traditional ED designs.

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For a more comprehensive intake, physicians are most effective if they have a team of personnel to assist them. In many of the new models, the intake area could also be a site for initiating orders, drawing blood, and starting intravenous lines. This means the intake space may need to be bigger with room for supplies and clinical work areas. The intake model and the design of the intake space must be integrated into the patient flow scheme for the entire department.

Whichever model is chosen, it is important to understand other critical factors that will influence the design of intake spaces. Foremost is the pressure to identify cardiac patients rapidly by quickly performing an electrocardiogram (EKG) on any patient who might be presenting with acute coronary syndrome. The recognition of atypical presentations of acute coronary syndrome patients has led to the new practice of performing an EKG on any patient with symptoms "between the nose and the navel."

Many older triage rooms are not big enough for a patient to recline for an EKG and to accommodate an EKG machine at the bedside, nor do they have curtains to allow the privacy required for an EKG. Whether the multidisciplinary team selects a model employing multiple curtained intake bays married to a rapid initial intake process, or separate intake rooms married to a comprehensive team intake process, private space will be necesssary for EKG evaluations. This might mean an EKG alcove with curtains next to the triage pod or some other design innovation to meet this particular need.

There will be new pressures to have patients seen by a physician sooner because arrival-to-provider times will be reportable to CMS. With this as an incentive, an adequate number of intake spaces will be an imperative. Remembering the arrival curve already mentioned, patients arrive in surges during the afternoon and evening shifts. Knowing the census of an ED can help designers plan their designs for an appropriate number of intake spaces.

The low-flow/high-flow model from Thomas Jefferson University presents another idea for consideration in ED design. Medium- and low-volume

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EDs struggle with extreme swings in census that can sometimes show 100% variation or more from one day to the next. A design that can accommodate these extreme variations in census and arrivals with coordinated operational changes allows the ultimate in flexibility. This means that an ED might look like a traditional department at low-flow times with the immediate bedding of patients, in-room triage, and bedside registration, sometimes called *pull to full*, described in a North Carolina ED (Colucciello, 2009). Later in the day, when the predictable surge of patients arrives and census exceeds capacity, an intake area with a physician-led triage team opens up. This kind of adaptability and flexibility in design and operations is cutting edge and not seen in most current ED designs.

Improvements in Throughput

Although there is not as much in the literature about operational improvements in the ED throughput domain, there are trends worth noting and considering for integration into design.

Patient Segmentation

As EDs have experienced gains in annual census, the practice of patient segmentation has grown. The earliest example of patient segmentation (also called *streaming*) was the development of the *fast track,* an area in an ED dedicated to the care of patients with lower-acuity conditions, typically minor accidents and injuries. The evidence supporting efficacy, efficiency, and improved performance when a fast track is introduced is now exhaustive and irrefutable (Darrab et al., 2006; Ieraci, Digiusto, Sonntag, Dann, & Fox, 2008; Kwa & Blake, 2008; Nash, Nguyen, & Tillman, 2009; Rodi, Grau, & Orsini, 2006; Sanchez, Smally, Grant, & Jacobs, 2006; Simon et al., 1996).

At Mary Washington Hospital in Fredericksburg, Virginia, Dr. Jody Crane has taken patient segmentation even further. Published in a trade paper and not a peer-reviewed journal, Dr. Crane has used Lean processes to improve patient flow in his 100,000-visit ED. By creating even more tracks dedicated to the treatment of patients of varying acuity and clinical needs, he has reduced LWBS, decreased LOS, and improved patient satisfaction (Welch, 2008). At Banner Health System in Phoenix and Mesa, Arizona, a similar "quick look" at patients and then patient segmentation have been employed in a new intake model. All of the tools and a detailed description of this innovation can be found on the Internet (Banner Health, 2011). Banner calls this process "D2D SPF" (Door to Doc Split Patient Flow).

Less sick patients are not undressed or bedded; instead they are treated as though they were in a clinic setting. The sickest patients are seen in an expedient manner and treatment is begun. Banner implemented this new process across eight different EDs with varying volumes and saw reductions in the LWBS rates of 30% to 60% across the board. This concept of patient segmentation allows for less acute patients to be moved out of beds after initial examination. Such accelerated bed turnover, much like table turns in a restaurant, allows more patients to be seen in the same space, effectively expanding the capacity of the ED.

Med Teams

Knowledge about teams and their superiority in complex work environments is well established in other service industries (Barker, 1993; Hackman, 1987; Kozlowski & Bell, 2003; Scholtes, Joiner, & Streibel, 2003; Serfaty, Entin, & Johnston, 1998; Wageman, 1997). Beginning in the late 1990s, research on *med teams* and formal teamwork training appeared in the medical literature, often applied to the ED (Barrett, Gifford, Morey, Risser, & Salisbury, 2001; Morey et al., 2002; Risser et al., 1999; Sexton, Thomas, & Helmreich, 2000). In the past decade this research has taken off with applications to most hospital-based service lines including labor and delivery, the ED, the operating room, and the trauma suite (Awad et al., 2005; Capella et al., 2010; Guise et al., 2010; Kilner & Sheppard, 2010; McConaughey, 2008; Patel & Vinson, 2005). An example of a med team in an ED would include a physician, two nurses, four techs, and a unit clerk all assigned to the same patient care area, working together to care for the same set of patients.

Geographic Zones

In a busy ED, a med team's approach is married to a geographic zone to create a functional operating unit that improves communication and clinical care (Asplin et al., 2008; Eitel, Rudkin, Malvehy, Killeen, & Pines, 2010; Jensen & Crane, 2008; Olshaker, 2009). According to the Studer Group, ED nurses walk 5.2 miles per shift (Leighty, 2006). This could be reduced by placing staff in a large ED in one geographic area of the department for the duration of a shift. One of the largest EDs in the country demonstrating high-level performance on operating metrics is William Beaumont Medical Center in Royal Oak, Michigan. This department, which sees more than 120,000 visits annually in a whopping 110-bed ED, is divided into seven functional units to improve quality, safety, efficiency, and flow (Welch, 2009).

Internal Waiting Room

Another new and important concept relative to ED operations has been termed "keeping patients vertical." Nationwide statistics reveal that EDs admit approximately 14% of all visits (McCaig & Nawar, 2006); this means that 86% of ED patients go home. In addition, the majority of patients are ambulatory upon arrival. Thus, EDs are experimenting with keeping patients ambulatory and having them wait for results in an internal waiting room, as opposed to occupying an ED room for the entire LOS.

At Massachusetts General Hospital, located in Boston, Massachusetts, the ED sees in excess of 88,000 visits annually. It has implemented a complex new ED flow process that begins with patient segmentation by acuity. Also presented as a case study at an AHRQ conference in 2010, the data demonstrated improvement. An important change in the physical plant to support this process involved the creation of an internal waiting room called the *post-screening area* with comfortable chairs. The internal waiting room enables less acute patients to remain vertical instead of occupying bed space while awaiting test results. The sum of these changes to the physical plant and operations resulted in an 8% decrease

in LOS and a drop in LWBS rate from 4.1% to 2.4% (Welch & Davidson, 2010).

Reclining Chair Units

The idea of using reclining chairs for intake has already been discussed. One study showed that most patients—particularly elderly patients—found reclining chairs much more comfortable than ED stretchers and had higher patient satisfaction when they were allowed to sit in them while waiting for test results and receiving care (Wilber, Burger, Gerson, & Blanda, 2005). The Chandler Medical Center at the University of Kentucky (part of the Pebble Project) is another example of the effective use of chairs as treatment spaces. This new ED was built using evidence-based design (Taylor & Cheng, 2011). One of the design features involved the design of the fast track area. As an evidence-based design project, the multidisciplinary team trialed both stretchers and reclining chairs for treating low-acuity patients. Their as-yet-unpublished data revealed increased patient satisfaction and decreased throughput times using the chair model. Reclining chairs were employed in the final design.

Information Technology

The advantages of an electronic whiteboard or tracking system in the ED have been recognized (France et al., 2005). Increasingly, EDs are using physician order entry and charting along with electronic tracking systems. In addition, the benefits of information technology (IT) that is integrated into workflow have been reported in the literature, but it is still an area in its infancy (Baumlin et al., 2010; Shapiro et al., 2010). EDs must take into account the space that such technology support requires. The most advanced departments (in terms of IT integrated into workflow) are operating with a computer for each member of the healthcare team, including social workers and case managers. This means that computer stations to accommodate all staff members will need to be factored into the ED design.

In addition, banks of common-use computers that any staff member can use are required. For instance, respiratory therapists, EKG technicians, and x-ray technicians are in the department transiently while involved in patient care, but they need to communicate on the electronic tracking system when the encounter with the patient has both started and finished. This information is vital to the healthcare team in tracking patient flow in real time, and it requires computer space. To get an idea of how many computers might be needed as hospitals become fully invested in a comprehensive electronic health record, the Pebble Project at the University of Kentucky Chandler ED used predictive modeling and forecasting to design a 50-bed ED with 240 computers for staff.

The development and success of patient segmentation, med teams, and geographic zones once again highlight the benefits to workflow of creating functional units in the ED.

Applications to Design

The development and success of patient segmentation, med teams, and geographic zones once again highlight the benefits to workflow of creating functional units in the ED. The acuity of the patients to be cared for will determine what the zone looks like. For instance, higher-acuity patients would likely be managed best on stretchers in larger rooms that can accommodate a resuscitation team, ventilator, EKG machine, and portable x-ray machine all at once. These rooms should be directly visible from the staff work station. Lower-acuity patients can be managed in reclining chairs in a zone of cubicles, and visibility is less critical.

The functional unit will need space for team members to carry out both clinical and clerical work, and adequate room for IT support is a must. Workflow should never be constrained because a healthcare worker cannot access a computer in the ED. The common practice of placing lovely granite countertops too narrow to hold computers and keyboards in the ED should be checked. All counter surfaces should be functional spaces.

Improvements at Outflow

The least studied area of operational improvement for the ED is the back end. This may be because the outflow of admitted patients has been such a difficult area for EDs. Addressing problems of overcrowding and boarding (holding admitted patients in the ED for long periods of time) requires hospital-wide flow solutions, and these are not under the control of the ED alone. Nonetheless, strategies that improve the outflow of patients who no longer need the services of the ED have been identified, and they are articulated in the following section.

Discharge Kiosks

Driven by the dire economic situation in the community that his ED served, Dr. Todd Taylor set up a discharge kiosk in the ED at Good Samaritan Medical Center in Phoenix, Arizona. When his 55,000-volume department was overrun with immigrant workers with no health insurance, he designed these kiosks to get low-wage workers signed up for any public assistance programs for which they were eligible. He had patients pass through these discharge kiosks to help usher them through the morass of paperwork involved and to help them find clinic care for future healthcare problems.

His program, which began as a revenue capture opportunity, was dubbed the "Turnstile ED," meaning patients passed through the virtual turnstile in the discharge kiosk. Discharge paperwork and prescriptions were then given. This program proved successful and kept his department financially viable, but it also turned out to be an operational success (Taylor, 2003; Welch, Viccellio, Davidson, McCabe, & Janiak, 2007).

Express Admission Unit

With bed space at a premium in the ED, strategies that allow patients to be moved away from acute care areas have proved an effective way to combat crowding. This has given rise to a new concept: *the express admission unit*, where pa-

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tients can wait until their rooms are ready. It is also a place where admission paperwork and processing can take place. When ED patients are ready for transfer to an inpatient bed (excluding critical care patients), they typically are in a phase of care that requires less clinical intensity. Diagnostics have been completed and early therapy has begun. Such patients no longer need the services of the ED and often need minimal observation by medical staff. The University of San Diego in San Diego, California, which sees 36,000 visits annually and is a teaching hospital with an emergency medicine residency, has published the first study showing the positive operational impact of an express admission unit (Buckley, Castillo, Killeen, Guss, & Chan, 2010).

The Clinical Decision Unit

There are data on the efficacy of an ED observation unit (Baugh, Venkatesh, & Bohan, 2011; Daly, Campbell, & Cameron, 2003). As pressures to avoid hospitalization (and readmissions) grow, a variation on the observation unit has evolved and is referred to as the *clinical decision unit.* Accumulating studies suggest that keeping patients for 6 to 8 hours for certain clinical conditions is a viable clinical management plan. Many patients requiring prolonged diagnostic testing, observation for overdoses, and other conditions, but who likely will not need 12–24 hours of care, might occupy such a unit (Calello et al., 2009; Nahab et al., 2011; Ross & Nahab, 2009; Ross et al., 2003; Schrock, Reznikova, & Weller, 2010). The lower-volume ED might segment any patients in need of 6 hours or more and send them to the observation unit. High-volume departments might have the numbers to support both a clinical decision unit and an observation unit as service lines with unique, dedicated space.

Applications for Back-End Design

There is a knowledge deficit surrounding the back end of the ED visit. Research regarding patient flow out of the ED is in its early days. Whether patients are admitted or discharged or placed into observation, operational best practices have yet to be determined. Is an express admission unit more efficacious than boarding a patient in the ED? Is a discharge team more efficacious than primary care nurse discharge? Relative to research on the front end, there is clearly work to be done.

A number of factors will influence and change discharge from the ED as healthcare reform in the United States moves forward. As mentioned previously, with the aging of the population comes an increase in the complexity of the patients receiving care. This means that more discharge planning will be needed as patients exit the ED. Healthcare reform will mean increased pressure to prevent readmissions for certain chronic conditions like chronic heart failure, acute heart attack, and pneumonia (Haglund, 2011). Hence a rebirth of interest in the observation unit concept and its many variations is being seen. Physicians and hospitals will be deterred from admitting certain patients under threat of financial penalty, and this will mean the involvement of a new member of the ED team, the case manager (Dunnion & Kelly, 2005; Kanaan, 2009). Zones

where case managers can work with the healthcare team involving the patient and the patient's family are evolving.

Concern for crowding should encourage design professionals to work with clinicians to design spaces that allow patients who no longer need the clinical intensity of the ED to be moved quickly out.

Concern for crowding should encourage design professionals to work with clinicians to design spaces that allow patients who no longer need the clinical intensity of the ED to be moved quickly out.

Limitations

Many of the operational innovations described in this review are new and have not been validated by randomized controlled studies or formal peer review. These process innovations and suggested design changes may have unintended consequences in terms of workflows, and this should be noted. In addition, these changes may have practical constraints. Still, in the spirit of innovation, this review organizes and collates these new operational ideas for the sake of expanding knowledge in the field. Finally, this paper looks at ED design in the United States and focuses on anticipated reforms. That said, many of these design strategies are appearing in Europe and Australia, and some of the studies cited in this paper were from outside the United States.

Conclusions

ED operational research has begun to capture the attention of practitioners trying to improve the delivery of care in the ED. Most departments are struggling to deliver safe and efficient care in emergency rooms that were designed in a different era. Most clinicians looking at the prospect of a new build or redesign of their departments will be largely unaware of this body of research and new information. Unpublished data can help inform ED design; unpublished innovations demonstrate ways to improve ED operations.

As evidence-based design concepts take hold in the architecture, design, research, and clinical arenas, we can look forward to EDs designed for the work being done in them. This metasynthesis is an attempt to summarize the latest research and data available involving ED operations and to apply it conceptually to ED design. It is written in the hope that design professionals and clinicians can work together to design effective spaces for safe, efficient, quality-driven healthcare.

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CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, RN, MS, NEA-BC, Vice President Nursing and Clinical Services
Rose Colangelo, RN, MSN, CEN, Manager of Emergency Services, Scripps Memorial Hospital La Jolla. Co-Chair CHA EMS/Trauma Committee
Rupy Sandhu, Emergency Department Nurse Director, UC Davis Medical Center

SUBJECT: Emergency Department Registration Process

SUMMARY

At the August 29th meeting, the subject of timely ED registration was discussed. Both Rupy Sandhu at UC Davis and Rose Colangelo from Scripps will update the group with their practices.

DISCUSSION QUESTIONS

1. What barriers or issues are occurring with the ED registration process?
2. Is there other work that needs to occur from CHA to assist?

BJB:br

CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, RN, MS, NEA-BC, Vice President Nursing and Clinical Services

SUBJECT: Designation Fees

SUMMARY

LEMSA designation fees are a hot topic. Kern County is requesting new fees of $25,000 for each hospital for Stroke, STEMI, Peds and Burns designation. Kern County presently only has Trauma designation fees and with the addition of these new fees, they would be one of the highest designation fee LEMSA requests across the state.

The Hospital Association of Northern and Central California was able to get an Auditor Controlled Study performed that helped reduce the fees to $19,000 per designation. However, this audit had flaws and did not fully explain the rationale for costs and specific services performed. (See Kern County Board of Supervisors letter).

There is also concern that the Riverside LEMSA may be contemplating increases. This represents a complex issue as no LEMSA and or county infrastructure is similar. Each has a different organizational makeup and funding mechanism and use different sources to fund EMS. They also provide different services based on resources and hospital collaboration.

DISCUSSION QUESTIONS

1. Are you aware of your LEMSA designation fee charges and the rationale behind them?
2. Have your fees increased over the years and if so, why?
3. Would you be in favor of an independent study that addresses transparency and the ability to understand LEMSA designation fees?

Attachments: Hospital Council Letter to Kern County Board of Supervisors, December 3, 2018

BJB:br

Hospital Council
of Northern & Central California

Excellence Through Leadership & Collaboration

December 3, 2018

Board of Supervisors
Kern County Administrative Center
1115 Truxton Avenue
Bakersfield, CA 93301

Dear Kern County Board of Supervisors,

Thank you for the opportunity to offer comments on the fee study.

The Hospital Council of Northern and Central California would like to thank the board and the county administrative staff for having the auditor controller conduct a study on the EMS designation fees. The auditor's report resulted in a net reduction in the proposed designation fee schedule. Nonetheless, based on the current level of hospital subsidy to the EMS system, and the anticipated third-party regulatory fee increases, Hospital Council hospitals are unable to support additional fees.

The auditor controller study fails to make clear the time spent on Level IV trauma designations. Since the county already receives a designation fee of $140,113 from the lone Level II trauma center – a charge that will remain unchanged under the new fee proposal – hours related to the oversight of Level II trauma should be excluded when calculating uncovered county expenses. Only trauma Level IV data should be included in the study. Yet the auditor's study allocates 622.5 hours out of the 2,724.70 hours associated with designation activities, or a full 23 %, to trauma -- an indication the Level II hours have been inadvertently included in the calculations.

While the auditor notes in the fee calculations that "Trauma refers to Level I (sic) trauma designation, not Level II designation," the methodology and the supporting data do not indicate that Level II was actually removed. The county's methodology essentially calculates all costs associated with designations ($289,783.40) and then divides the total by the number of designations under contract (15) to come up with the average cost per designation -- 19,318.89

Additionally, minutes from previous EMCAB meetings (May 2012 for STEMI, as an example, page 5 attached) and materials related to the original ordinance make it clear that Kern County, like other counties in the state, relies on third-party accreditation for specialized services. The Kern County STEMI Policies and Procedures, for example, cite the American Health Association accreditation as a better and more appropriate authority.

Third-party accreditation requirements alleviate the need for extensive hours in oversight, as the county needs to simply validate the extensive administrative work of the hospitals and the third-party accrediting agencies. Since third-party accreditation cost each hospital hundreds of thousands of dollars a year to maintain, the proposed local fees are duplicative and are no more than an apparent tax on the hospitals.

A few examples of what local hospitals pay for third-party accreditation and MICN:
- Ridgecrest Regional Hospital: $778,000
- Mercy Hospital Downtown and Southwest: $852,941

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www.hospitalcouncil.org

- Bakersfield Memorial Hospital: $412,360

The auditor study also references SLO EMS as a comparable fee. However, the SLO fee covers many more services than designation and applies only to STEMI and Trauma. The study also references San Bernardino County charging similar fees; however, San Bernardino only charges fees for Stroke, STEMI and Trauma.

Finally, the county auditor's report fails to address Public Health's decision to charge a $25,000 application fee. Per legal counsel, the justification for the application fee appears to operate under the logic that an initial application takes the same amount of time as annual designations. If this is the case, the fee should be the same as annual designations ($19,318.89, rather than the $25,000 listed based on previously reported hours).The county has still not provided justification for charging an initial application fee and designation fees in a given year.

As noted by the Greater Bakersfield Chamber of Commerce and the Mayor of Delano (letters attached), the proposed local fees are duplicative to the significant fees already paid by hospitals to meet national standards and are an apparent tax on hospitals. The hospitals already save the county hundreds of thousands of dollars a year absorbing costs associated with emergency services. Base hospitals, for example, which coordinate pre-hospital transports, require 24/7 dedicated nurse coverage paid for by the hospitals.

We would like to thank the Department of Public Health for its commitment at the 11/26 meeting to work through the EMS Collaborative and EMCAB on future EMS discussions and look forward to continuing dialogue around quality improvement.

Again, on behalf of our non-public hospitals in Kern, the Hospital Council would like to thank the county for listening to our concerns and we look forward to continuing this conversation in the spirit of transparency. If I may be of assistance, please do not hesitate to contact me at 559-650-5694.

Sincerely,

Shauna Day
Regional Vice President- *Central Valley and Central Coast*

Hospital Council of Northern & Central California
Excellence Through Leadership & Collaboration

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CALIFORNIA HOSPITAL ASSOCIATION

Providing Leadership in Health Policy and Advocacy

December 11, 2018

TO: CHA EMS/Trauma Committee Members

FROM: BJ Bartleson, RN, MS, NEA-BC, Vice President Nursing and Clinical Services

SUBJECT: Roundtable Topics for Discussion

SUMMARY

CHA will highlight information along with members on these topics.

1) Community Paramedicine and Alternate Destination Update
2) APOT, next steps
3) EDIE Update
4) CURES and Opioid Issues
5) Behavioral Health holds

DISCUSSION QUESTIONS

1. What concerns or issues do members have regarding the topics above?
2. If you are using EDIE are you involved in whole person care work as well?
3. How are CURES and opioid issues going in ED?

BJB:br

JAMA Neurology | Original Investigation

Modeling Stroke Patient Transport for All Patients With Suspected Large-Vessel Occlusion

Jessalyn K. Holodinsky, MSc; Tyler S. Williamson, PhD; Andrew M. Demchuk, MD; Henry Zhao, MBBS; Luke Zhu; Michael J. Francis; Mayank Goyal, MD; Michael D. Hill, MD, MSc; Noreen Kamal, PhD

IMPORTANCE Ischemic stroke with large-vessel occlusion can be treated with alteplase and/or endovascular therapy; however, the administration of each treatment is time sensitive.

OBJECTIVE To identify the optimal triage and transport strategy: direct to the endovascular center (mothership) or immediate alteplase treatment followed by transfer to the endovascular center (drip and ship), for all patients with suspected large-vessel occlusion stroke.

DESIGN SETTING, AND PARTICIPANTS This was a theoretical, conditional probability modeling study. Existing data from clinical trials of stroke treatment were used for model generation. The study was conducted from February 1, 2017, to March 1, 2018.

MAIN OUTCOMES AND MEASURES The time-dependent efficacy of alteplase and endovascular therapy and the accuracy of large-vessel occlusion screening tools were modeled to estimate the probability of positive outcome (modified Rankin Scale score, 0-1 at 90 days) for both the drip-and-ship and mothership transport strategies. Based from onset to treatment, the strategy that estimates the greatest probability of excellent outcome is determined in several different scenarios.

RESULTS The patient's travel time from both thrombolysis and endovascular therapy centers, speed of treatment, and positive predictive value of the screening tool affect whether the drip-and-ship or mothership strategy estimates best outcomes. With optimal treatment times (door-to-needle time: 30 minutes; door-in-door-out time: 50 minutes; door-to-groin-puncture time: 60 minutes [mothership], 30 minutes [drip and ship]), both options estimate similar outcomes when the centers are 60 minutes or less apart. However, with increasing travel time between the 2 centers (90 or 120 minutes), drip and ship is favored if the patient would have to travel past the thrombolysis center to reach the endovascular therapy center or if the patient would arrive outside the alteplase treatment time window in the mothership scenario. Holding other variables constant, if treatment times are slow at the thrombolysis center (door-to-needle time: 60 minutes; door-in-door-out time: 120 minutes), the area where mothership estimates the best outcomes expands, especially when the 2 centers are close together (60 minutes apart or less). The area where mothership estimates the best outcome also expands as the positive predictive value of the screening tool increases.

CONCLUSIONS AND RELEVANCE This study suggests that decision making for prehospital transport can be modeled using existing clinical trial data and that these models can be dynamically adapted to changing realities. Based on current median treatment times to realize the full benefit of endovascular therapy on a population level, the study findings suggest that delivery of the treatment should be regionally centralized. The study modeling suggests that transport decision making is context specific and the radius of superiority of the transport strategy changes based on treatment times at both centers, transport times, and the triaging tool used.

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Editorial
Supplemental content

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Fast treatment of acute ischemic stroke is essential for disability-free survival.[1,2] The evolution of time-dependent therapeutics for ischemic stroke refocuses the need to consider how to triage patients with suspected stroke in the field. Endovascular therapy (EVT), a minimally invasive endovascular procedure, is a more effective reperfusion method than intravenous alteplase for ischemic stroke with large-vessel occlusion (LVO).[3] The facilities and expertise needed for EVT are typically limited to urban tertiary hospitals. Conversely, intravenous alteplase is widely available and relevant for patients with ischemic stroke with and without LVO. Both treatments are time sensitive and may be given alone or in combination.[4,5]

Endovascular therapy has resulted in the new problem of identifying patients with probable LVO such that they could be preferentially moved to an EVT center.[6-10] Patients who received EVT with long interhospital transfer delays experienced worse outcomes than those without interhospital transfer.[11] Neurovascular imaging is the standard to determine EVT eligibility, but high-quality imaging in the field (eg, a mobile stroke unit capable of computed tomographic angiography[12]) is not available for most patients. Several clinical scores for use by paramedics modeled after the National Institutes of Health Stroke Scale have been developed.[13] Three commonly used scales are the Cincinnati Prehospital Stroke Severity Scale (C-STAT), the Rapid Arterial Occlusion Evaluation (RACE), and the Los Angeles Motor Scale (LAMS), each with varying predictive value.[14-16] We sought to model the best transport strategies for acute stroke, balancing the benefit of early alteplase treatment, the greater efficacy of EVT, and declining benefit of both treatments over time. The study was conducted from February 1, 2017, to March 1, 2018.

Key Points

Question In suspected acute ischemic stroke with large-vessel occlusion, should thrombolysis-capable stroke centers be bypassed in favor of direct transfer to endovascular-capable stroke centers?

Findings In this theoretical, conditional probability modeling study, the dominant transport strategy depends on the patient's distance to both centers and treatment speed. If treatment times are slow at the thrombolysis center, bypass should be considered when the centers are 60 minutes or less apart; with greater transport times between centers, bypass is not always favorable.

Meaning Regional centralization of stroke triage to endovascular therapy centers will increase positive outcomes after ischemic stroke treatment; immediate alteplase treatment followed by transfer to the endovascular center requires fast treatment and is most relevant for longer transport times.

Methods

Terminology and Simplifying Assumptions

Hospitals are classified as either thrombolysis or EVT centers. A thrombolysis center can administer intravenous alteplase (with onsite stroke expertise or telemedicine services) but does not provide EVT. An EVT center provides both EVT and intravenous alteplase treatment. In this analysis, 2 different treatment paradigms are discussed: the mothership and drip-and-ship treatment paradigms. We assume that treatments are always available. In the mothership paradigm, the patients are transported directly to an EVT center (potentially bypassing closer thrombolysis centers) and in the drip-and-ship paradigm, patients are first treated with intravenous alteplase at a thrombolysis center and then transferred to an EVT center.

This study is an extension of previously published modeling frameworks (eTable 1 in the Supplement).[17,18] We assume that stroke onset time is known and transport decisions are made after emergency medical services evaluation using an LVO screening tool and that the decision does not change en route. We assume that patients with occlusions within the guideline treatment time window and without medical contraindications to thrombolysis are eligible for alteplase and that patients with LVOs are eligible for EVT. Last, because the rate of spontaneous early recovery among patients with LVO is low, we assume that patients estimated to have an LVO achieve reperfusion only with treatment. Because this is a modeling study using previously published data in aggregate, ethics board approval was not required at the University of Calgary, Alberta, Calgary, Canada.

Model Components

This model combines conditional probabilities of excellent outcome constructed from clinical trials of stroke treatment and therefore reflects population averages and applies at the population level. We have approached the problem practically using the probability of achieving excellent outcome (modified Rankin Scale [mRS] 0-1 at 90 days) within a given time from stroke onset to treatment.

Patients with LVO (extracranial or intracranial internal carotid artery, middle cerebral artery-M1 segment, or proximal middle cerebral artery-M2 segment occlusion) will receive both alteplase and EVT either at the EVT center or in a drip-and-ship approach. For EVT, the time-dependent probability of excellent outcome was derived from the Highly Effective Reperfusion Evaluated in Multiple Endovascular Stroke trials collaboration time to treatment analysis.[5] For alteplase, the time-dependent probability of excellent outcome was derived from an individual patient data meta-analysis (**Table**).[4] For mothership transport, time from onset to treatment is the sum of time from onset to medical contact, ambulance response and time spent on the scene, travel to the EVT center, and door-to-needle time or door-to-groin-puncture time at the EVT center (alteplase treatment). For drip and ship, transport time from onset to treatment is the sum of time from onset to medical contact, ambulance response and time spent on the scene, travel to the thrombolysis center, and door-to-needle time at the thrombolysis center (alteplase treatment), time from thrombolysis administration to departure for the EVT center, travel from the thrombolysis center to the EVT center, and door-to-groin-puncture time at the EVT center (EVT treatment) (eFigure 1 in the Supplement). Three different time scenarios were used: scenario A describes an optimized system, scenario B assumes slow treatment at the thrombolysis

Table. Conditional Probability Values and Data Sources

Probability[a]	Value	Rationale/Data Source
Large-Vessel Occlusion		
P(mRS 0-1|EVT and OTT = ×)	$0.3394 + 0.00000004\times^2 - 0.0002\times$; minimum value = 0.129	The exponential common odds ratio decay presented in the HERMES collaboration time to treatment analysis was used.[5] This decay was extrapolated to symptom onset to treatment times less than 120 min. Using P(mRS 0-1|control) as the baseline, this was transformed into a second order polynomial function depicting P(mRS 0-1|EVT) over time. This decay is capped at a minimum probability of excellent outcome of 0.129, which is the P(mRS 0-1|control) in the HERMES data.
P(mRS 0 - 1|alteplase and OTT = ×)	$0.2359 + 0.0000002\times^2 - 0.0004\times$; minimum value = 0.1328	The exponential decay presented in the Emberson et al[4] effect of treatment delay meta-analysis was used. This decay was extrapolated to onset to treatment times of <60 min. Because this study includes data from patients with both small and large occlusions, we adjusted this decay using NIHSS as a surrogate for occlusion location to estimate outcomes of alteplase treatment over time in patients with LVO. Using P(mRS 0-1|NIHSS 11+ and control) as the baseline value, this was transformed into a second-order polynomial function depicting P(mRS 0-1|alteplase and LVO) over time. At 4.5 h from onset, the function is set to a minimum value of 0.1328, which is the P(mRS 0-1) given no treatment in the patients with NIHSS 11+ in this meta-analysis.[4]
Non-Large-Vessel Occlusion		
P(mRS 0 - 1|alteplase and OTT = ×)	$0.6343-0.00000005\times^2 - 0.0005\times$; minimum value = 0.4622	The exponential decay presented in the Emberson et al[4] effect of treatment delay meta-analysis was used. This decay was extrapolated to onset to treatment times of <60 min. Because this study includes data from patients with both small and large occlusions, we adjusted this decay using NIHSS as a surrogate for occlusion location to estimate outcomes of alteplase treatment over time in patients with nLVO. Using P(mRS 0-1|NIHSS 0-10 and control) as the baseline value, this was transformed into a second-order polynomial function depicting P(mRS 0-1|alteplase and nLVO) over time. At 4.5 h from onset, the function is set to a minimum value of 0.4622, which is the P(mRS 0-1) given no treatment in the patients with NIHSS 0-10 in this meta-analysis.[4]
Intracerebral Hemorrhage		
P(mRS 0-1)	0.24	This was generated by combining the overall excellent outcome rate in several trials of intracerebral hemorrhage treatment.[19-23] The STICH-II trial in patients with spontaneous ICH of 10-100 mL showed that early surgery had no benefit over conservative treatment.[19] The FAST trial showed no difference between recombinant factor VII (at 2 different doses) and placebo There was also no significant interaction found between treatment effect and time from onset to treatment.[20] The INTERACT2 trial showed no difference between early intensive BP lowering (SBP <140 mm Hg within 1 h) and guideline-recommended therapy (SBP <180 mm Hg) in the primary outcome (death and disability at 90 d); however, a favorable shift in the overall distribution of mRS scores at 90 d was found.[21] The greatest benefit was found in patients who were able to achieve the greatest SBP reductions within 1 h of randomization[22]; however, randomization occurred a median of 3.7 h after ICH onset. Thus, it remains unknown if this time benefit would persist in the hyperacute window after onset. The INCH trial found no difference between fresh frozen plasma or prothrombin complex concentrate in 90-d clinical outcomes in patients with vitamin K antagonist-related hemorrhages.[23] Because none of these trials showed emergency treatment to be superior to standard of care, this probability is considered time invariant.
Stroke Mimics		
P(mRS 0-1)	0.90	Because most stroke mimics do not have time-dependent treatment options, the probability of excellent outcome for these patients is considered to be time invariant and is set at 0.90 based on the outcomes of stroke-mimic patients in prior studies.[24-28]

Abbreviations: BP, blood pressure; EVT, endovascular therapy; FAST, Factor Seven for Acute Hemorrhagic Stroke; HERMES, Highly Effective Reperfusion Evaluated in Multiple Endovascular Stroke; ICH, intracerebral hemorrhage; INCH, International Normalized Ratio Normalization in Coumadin-Associated Intracerebral Hemorrhage; INTERACT2, Intensive Blood Pressure Reduction in Acute Cerebral Hemorrhage Trial 2; LVO, large-vessel occlusion; mRS, modified Rankin scale; NIHSS, National Institutes of Health Stroke Scale; nLVO, non–large-vessel occlusion; OTT, onset to treatment time; SBP, systolic BP; STICH, Spontaneous Supratentorial Lobar Intracerebral Haematomas.

[a] In probability notations, P followed by the open and closed parentheses indicates the probability of the statement within the parentheses occurring and the | symbol indicates given in the conditional probability statement.

center, and scenario C assumes slow treatment at both centers (eTable 2 in the Supplement).

Because clinical screening is imperfect, patients without LVO (false-positives) will also be identified including (1) ischemic stroke without LVO, (2) intracerebral hemorrhage (ICH), and (3) stroke mimics. Patients with subarachnoid hemorrhage or cerebral venous sinus thrombosis are not considered in this study. Patients with ischemic stroke without LVO within the guideline treatment window will be treated with alteplase. For this, the time-dependent probability of excellent outcome was derived from an individual patient data meta-analysis (Table).[4]

Patients with ICH may eventually require a higher level of care; however, there is currently indeterminate evidence on the efficacy of emergency medical or surgical treatment.[19-23] By combining the excellent outcome rates from several trials of emergency ICH treatment, the probability of excellent outcome for ICH is estimated to be 0.24 and is assumed to be time invariant (Table).[19-23] Because most stroke mimics are not immediately life threatening and do not have time-dependent treatment options, the probability of excellent outcome for these patients is considered time invariant (Table).[24-28]

Patient Diagnoses

Three prehospital LVO screening tools were modeled. The Los Angeles Motor Scale, a 5-point scale in which higher scores indicate ischemic stroke with LVO[16]; RACE, a 9-point scale in which higher scores indicate ischemic stroke with LVO[15]; and

C-STAT, a 3-item scale, originally developed to detect thrombolysis candidates, where scores of 2 or higher are indicative of LVO.[14] In a recent study of 565 consecutive paramedic-initiated code strokes in Melbourne, Australia, these scales were evaluated.[29] It was found that LAMS scores of 4 or greater, RACE scores of 5 or greater, and C-STAT scores of 2 or greater had positive predictive values for identifying LVO of 0.4538, 0.5294, and 0.4000, respectively (Henry Zhao, MBBS, email personal correspondence, April 21, 2017). The prevalence of proximal anterior circulation LVO among these patients was 14.5%.[29] See the eAppendix in the Supplement for detailed explanation of model components.

Visualizations

Results are visualized using 2-dimensional (2-D) temporospatial diagrams. These diagrams depict a single thrombolysis center in the middle of the figures and a single EVT center at varying transport times below it. Concentric circles representing 5-minute increments of travel time radiate from the thrombolysis center. Color coding is used to represent the transport option with the greatest predicted probability of excellent outcome. Red and green indicate that drip and ship and mothership, respectively, estimate the best probability of excellent outcome. Areas where the 2 options estimate near-equivalent outcomes (probabilities within 0.01 of each other) are indicated using white stippling. Color intensity increases as the probability of achieving excellent outcome increases.

To show geographic context, results in California are also visualized. For the purposes of this illustration we have used data from The Joint Commission Quality Check Stroke Certification program as a surrogate for EVT capability.[30] We considered acute stroke-ready and advanced primary stroke centers to be thrombolysis centers and advanced comprehensive stroke centers to be EVT centers. Maps were generated using a desktop application developed for this research (DESTINE; Apple Inc). Esri's ArcGIS Software Development Kit was used to access a map of California. A 3 × 3-km grid was overlaid on the state and the geographic coordinates of the center of each grid section was passed through Google's Distance Matrix API (Google Inc) to estimate the ground transport time to each hospital under optimal driving conditions. These travel times were fed into the conditional probability models and the probability of excellent outcome for each strategy in each grid section was calculated. The grid sections were color coded in the same manner as the 2-D temporospatial diagrams.

Results

We modeled the probability of excellent outcome for both the drip-and-ship and mothership transport models, with varying transport times to and between centers (eAppendix and eFigure 1 in the Supplement). This model differs from prior published models.[17,18] The earlier models assumed that patients were known to have an acute ischemic stroke with LVO. In this model, patients are suspected to have an LVO based on an LVO screening tool. The treatment options for other possible diagnoses (non-LVO, ICH, and stroke mimics) were also included. eTable 1 in the Supplement provides a comparison of this and prior models.

Several scenarios were created illustrating the association of varying transport times, treatment times, and screening-tool positive predictive values with decision making (eTable 3 in the Supplement). Each scenario was visualized using 2-D temporospatial diagrams. These scenarios (eTable 2 in the Supplement) were also visualized in California.

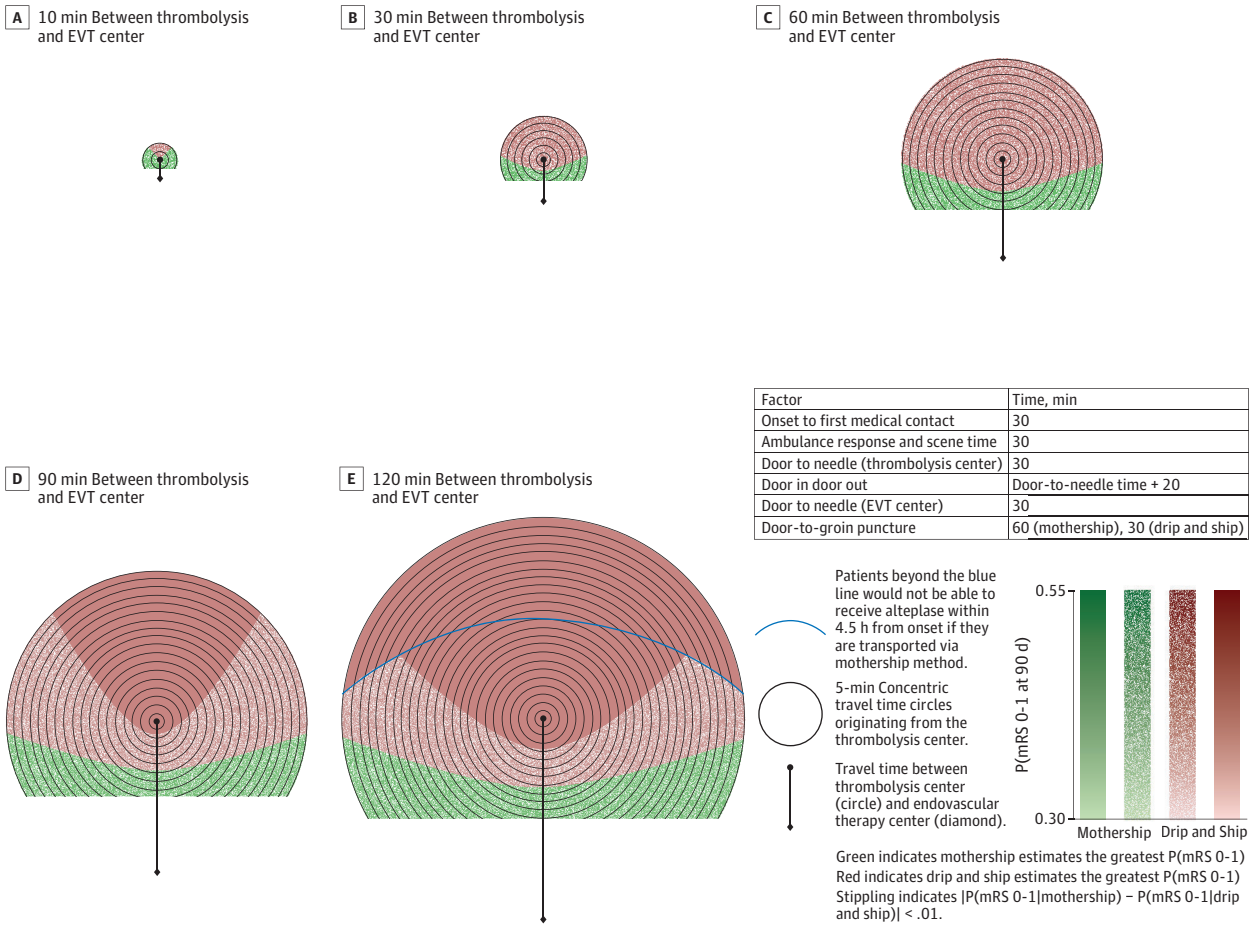
When the patient is closest to the EVT center, mothership always estimates the greatest probability of excellent outcome. Patients with known contraindications to thrombolysis, including those beyond 4.5 hours from onset, should also be transported directly to an EVT center. When the patient is closest to the thrombolysis center, outcomes vary by transport time and treatment efficiency. With optimal treatment times (scenario A, eTable 2 in the Supplement) (door-to-needle time: 30 minutes; door-in-door-out time: 50 minutes; door-to-groin-puncture time: 60 minutes [mothership], 30 minutes [drip and ship]), when the thrombolysis and EVT centers are less than 60 minutes travel time apart, both strategies estimate near-equivalent probabilities of excellent outcome (**Figure 1**). As the transport time between centers lengthens (90 or 120 minutes), a region where drip and ship clearly outweighs mothership appears; this includes locations close to the thrombolysis center and the narrow corridor in which patients would have to travel past the thrombolysis center en route to the EVT center. This drip-and-ship area expands as the centers are moved further apart and is especially pronounced when the centers are 120 minutes apart. In this instance, there is an area in the temporospatial plane where, if transported by mothership route, the patient foregoes the opportunity for treatment with alteplase under current guidelines as onset to needle time would exceed 4.5 hours.

In scenario B (eTable 2 in the Supplement) (door-to-needle time: 60 minutes [thrombolysis center], 30 minutes [EVT center]; door-in-door-out time: 120 minutes; door-to-groin-puncture time 60 minutes [mothership], 30 minutes [drip-and-ship]), the outcome of slowing treatment at thrombolysis centers is shown; drip and ship is no longer associated with the greatest probability of excellent outcome when the travel time between centers is 60 minutes or less (**Figure 2**). Even as the travel time between centers increases, drip and ship clearly outweighs mothership only when travel time would preclude patients from receiving alteplase in the mothership model.

In scenario C (eTable 2 in the Supplement) (door-to-needle time: 60 minutes; door-in-door-out time: 120 minutes; door-to-groin-puncture time: 90 minutes [mothership], 60 minutes [drip-and-ship]), we consider slow treatment times at both centers. Here, drip and ship outweighs mothership only when travel time would preclude alteplase administration in the mothership scenario or if the centers are 120 minutes apart and the patient is in the immediate vicinity of the thrombolysis center (**Figure 3**).

The results for all 3 time scenarios, using the LAMS screening tool, in California are shown in **Figure 4** (enlarged maps of Los Angeles and San Francisco in eFigures 2 and 3 in the

Figure 1. Transport Decision Making in an Optimally Performing System

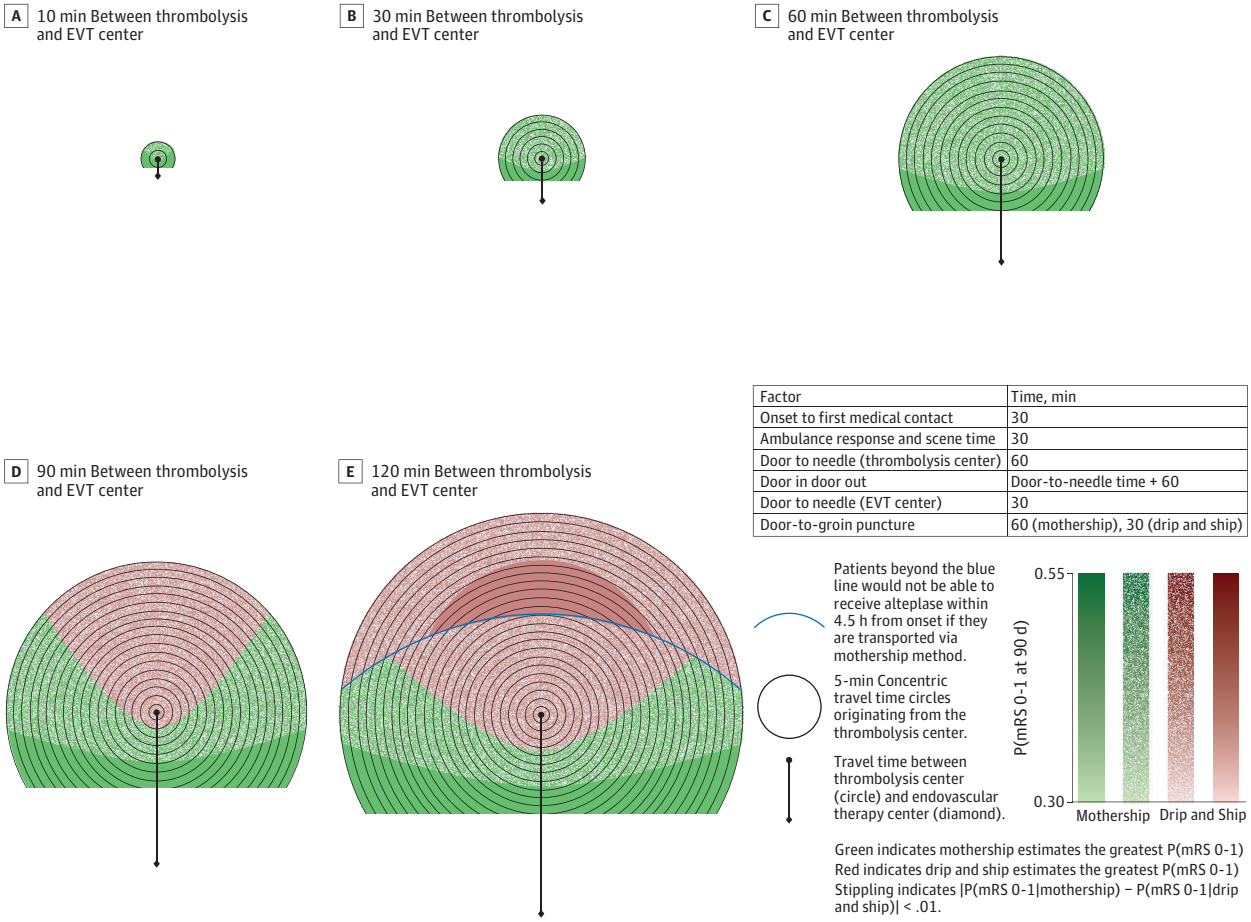


Two-dimensional temporospatial diagrams depicting transport decision making for patients with suspected ischemic stroke with large-vessel occlusion, defined as Los Angeles Motor Scale Score 4 or higher, in an optimally performing system. The diagrams depict a single thrombolysis center in the middle of the Figure, depicted with a circle, and an endovascular therapy center (EVT), depicted by a diamond, at travel times of 10 (A), 30 (B), 60 (C), 90 (D), and 120 (E) minutes below it. There are 5-minute concentric travel time circles radiating from the thrombolysis center. Red indicates areas where drip and ship estimates the greatest probability of excellent outcome and green indicates areas where mothership estimates the greatest probability of excellent outcome. White stippling indicates areas where the optimal transport method supersedes the other areas by 1% or less. Area where the patient is closest to the EVT center is not shown because the mothership option is always best in this scenario. The degree of color saturation reflects the value of the probability of excellent outcome. The blue line represents the point where the onset to needle time in the mothership scenario is more than 270 minutes.

Supplement). Consistent with the 2-D temporospatial diagrams in an optimal scenario, drip and ship outweighs mothership only when the thrombolysis center is far from EVT centers. In Figure 4A, both strategies estimate equivalent outcomes in the greater Los Angeles area. However, drip and ship is the best option for patients in Bakersfield, which is an approximate 2-hour drive from Los Angeles. In Figure 4B, where treatment at the thrombolysis center is slow, the areas where drip and ship clearly outweigh mothership have shrunk and are now the best option only for patients near Fresno, San Luis Obispo/Santa Maria, Redding, and a portion of Mendocino County. When treatment times are slow at both thrombolysis and EVT centers (Figure 4C), areas where drip and ship clearly outweigh mothership have decreased in size compared with Figure 4A, but remain larger than those in Figure 4B.

When using RACE scores of 5 or higher (higher positive predictive values than LAMS scores ≥4) to identify patients with probable LVO, a similar pattern of results is obtained. However, the area where mothership estimates the best outcomes enlarges slightly (eFigures 4-6 in the Supplement). Overall, the probability of excellent outcome decreases because a greater proportion of patients with LVO, who have inherently poorer outcomes, is identified. When using C-STAT scores of 2 or higher (lower positive predictive value than LAMS scores ≥4) to identify probable LVO, the drip-and-ship area expands (eFigures 7-9 in the Supplement), and the overall probability of excellent outcome increases as fewer patients with LVO are identified. Overall, the choice of prehospital scale does not substantively change the transport decision, as these scales have similar positive predictive values and the prevalence of LVO is low. The scenarios outlined deal with the complex interaction of several factors. The outcome of varying a single factor on the models is detailed in eTable 4 in the Supplement.

Figure 2. Transport Decision Making in a System With Slow Treatment Times at the Thrombolysis Center



Factor	Time, min
Onset to first medical contact	30
Ambulance response and scene time	30
Door to needle (thrombolysis center)	60
Door in door out	Door-to-needle time + 60
Door to needle (EVT center)	30
Door-to-groin puncture	60 (mothership), 30 (drip and ship)

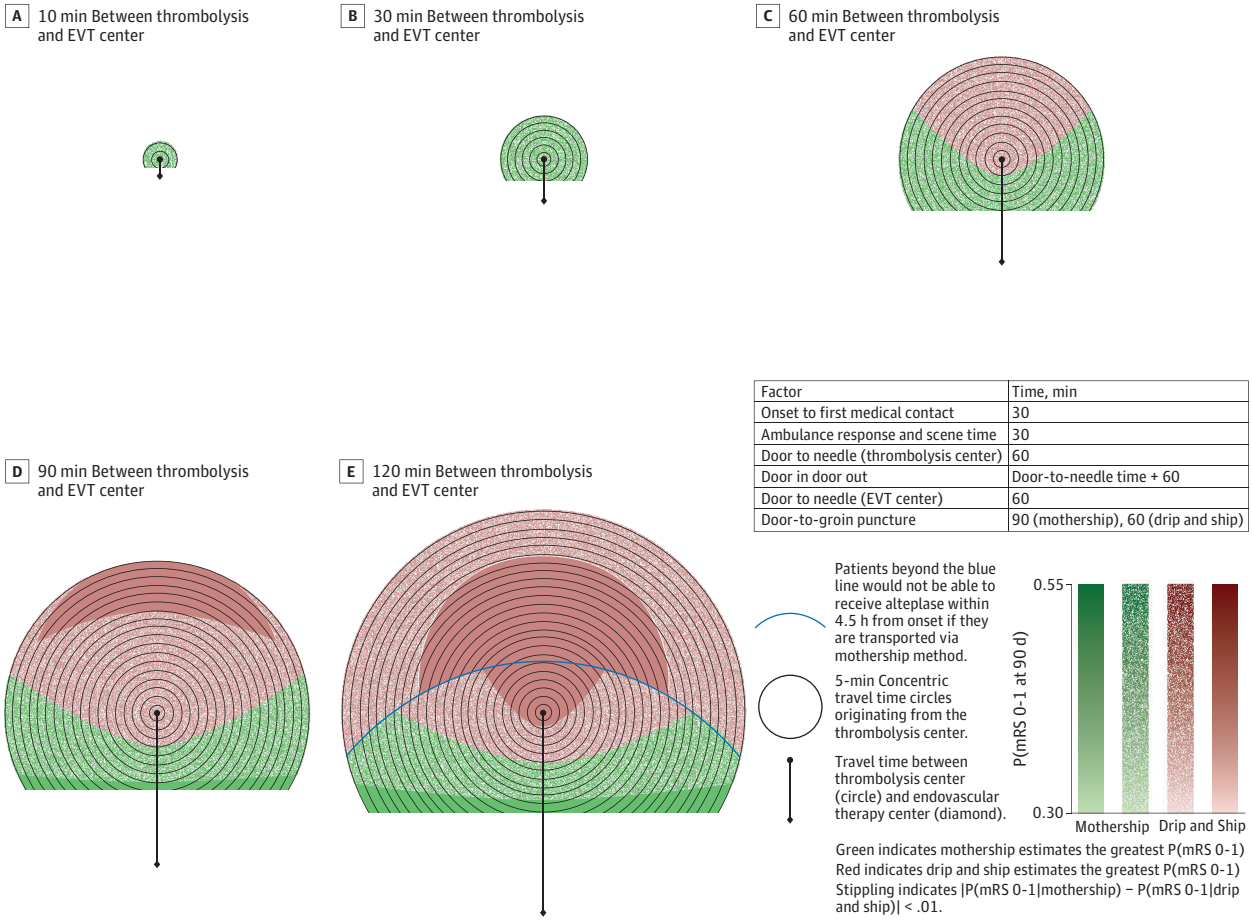
Two-dimensional temporal spatial diagrams depicting transport decision making for patients with suspected ischemic stroke with large-vessel occlusion, defined as Los Angeles Motor Scale Score of 4 or higher, in a system with slow treatment times at the thrombolysis center. The diagrams depict a single thrombolysis center in the middle of the Figure, depicted with a circle, and an endovascular therapy (EVT) center, depicted by a diamond, at travel times of 10 (A), 30 (B), 60 (C), 90 (D), and 120 (E) minutes below it. There are 5-minute concentric travel time circles radiating from the thrombolysis center. Red indicates areas where drip and ship estimates the greatest probability of excellent outcome and green indicates areas where mothership estimates the greatest probability of excellent outcome. White stippling indicates areas where the optimal transport method supersedes the other by 1% or less. Area where the patient is closest to the EVT center is not shown because the mothership option is always best in this scenario. The degree of color saturation reflects the value of the probability of excellent outcome. The blue line represents the point where the onset to needle time in the mothership scenario is more than 270 minutes.

Discussion

We have modeled and visualized a prehospital transport system for patients with acute ischemic stroke with suspected LVO using clinical trial data. The transport time threshold for bypass varies depending on treatment speed at the thrombolysis and EVT centers. This threshold is especially pronounced in scenario B, where door-to-needle time at thrombolysis centers is 60 minutes (door-in-door-out time, 120 minutes). This is the current reality in many stroke systems. Among hospitals in the Get With The Guidelines Target Stroke program, the postintervention median door-to-needle time was 67 minutes (interquartile range, 51-87 minutes).[31] Our results imply that, based on current treatment times, delivery should be regionally centralized to realize the full benefit of EVT on a population basis.

Transport decision making is context specific. The radius of superiority for mothership changes based on the relative location of centers to each other and the treatment times at these centers; thus, model inputs need to be customized regionally. This need has potential implications for current accreditation standards and time metrics for quality stroke care. One way to drive change is to accredit centers that cannot meet efficiency targets and are within a short travel time to centers that can at a lower level than those meeting targets and to use such accreditation to guide bypass decisions for emergency medical services. The same considerations on efficient treatment times apply equally to thrombolysis and EVT centers. Population density and distribution, not modeled here, are also important when establishing regional transport and triage policy. Areas where both transport options produce near-equivalent outcomes may be treated differently jurisdiction to jurisdiction owing to economics, staffing, and/or redundancy in resources.

Figure 3. Transport Decision Making in a System With Slow Treatment Times at the Thrombolysis Center and Endovascular Therapy Center



Factor	Time, min
Onset to first medical contact	30
Ambulance response and scene time	30
Door to needle (thrombolysis center)	60
Door in door out	Door-to-needle time + 60
Door to needle (EVT center)	60
Door-to-groin puncture	90 (mothership), 60 (drip and ship)

Two-dimensional temporal spatial diagrams depicting transport decision making for patients with suspected ischemic stroke with large-vessel occlusion, defined as Los Angeles Motor Scale Score of 4 or higher, in a system with slow treatment times at the thrombolysis center and endovascular therapy (EVT) center. The diagrams depict a single thrombolysis center in the middle of the Figure, depicted with a circle, and an EVT center, depicted by a diamond, at travel times of 10 (A), 30 (B), 60 (C), 90 (D), and 120 (E) minutes below it. There are 5-minute concentric travel time circles radiating from the thrombolysis center. Red indicates areas where drip and ship estimates the greatest probability of excellent outcome and green indicates areas where mothership estimates the greatest probability of excellent outcome. White stippling indicates areas where the optimal transport method supersedes the other by 1% or less. Area where the patient is closest to the EVT center is not shown because the mothership option is always best in this scenario. The degree of color saturation reflects the value of the probability of excellent outcome. The blue line represents the point where the onset to needle time in the mothership scenario is more than 270 minutes.

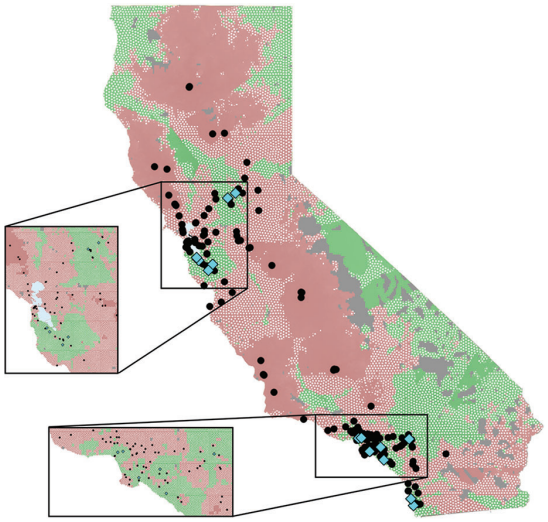
An ongoing randomized clinical trial is addressing the question of transport strategy in Barcelona (RACECAT [Direct Transfer to an Endovascular Center Compared to Transfer to the Closest Stroke Center in Acute Stroke Patients With Suspected Large Vessel Occlusion]).[32] Owing to context-specific factors having an association with decision making, the results of RACECAT may not be generalizable to other jurisdictions with different geographic constraints. However, empirical data from RACECAT may be combined with this modeling approach to estimate the ideal strategy in regions where a randomized comparison is not feasible.

The benefits of prehospital screening tools on transport decision making appear to be modest. Given the need to keep things simple in the prehospital environment, the most easily taught of these scales is likely to gain the most traction with emergency medical services. The merits of each tool should be considered when choosing one for implementation. Any intervention that would speed triage and transport in the prehospital environment may change the transport strategy estimated to be most favorable. However, this change would benefit all patients because time from onset to treatment would be shortened.

In taking a population perspective, we have not taken into consideration the political and economic realities that sometimes govern system design. Stroke due to suspected LVO accounts for a minority of the total stroke population. In the Melbourne triaging study, LVO prevalence was only 14.5%. Depending on the screening tool used, anywhere from 18.4% to 21.4% of patients would have screened positive for LVO and therefore be guided by this model.[29] The remaining approximately 80% of patients would not be considered potential bypass candidates, and thus would require treatment at thrombolysis centers. Strategies need to be in place for urgent drip-and-ship transport for patients identified to have an LVO at the

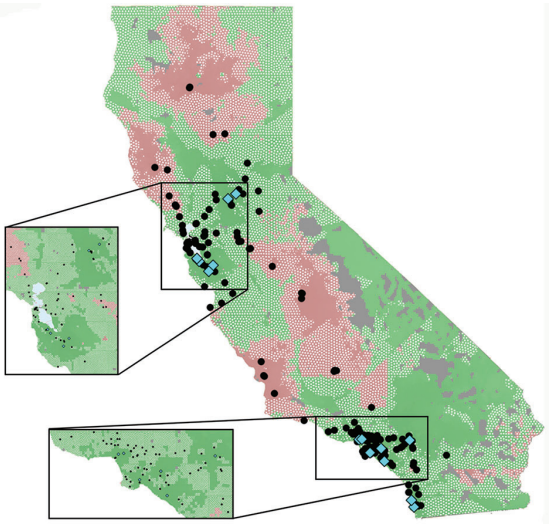
Figure 4. Best Estimated Transport Strategy With Probability of Excellent Outcome

A Optimized treatment times



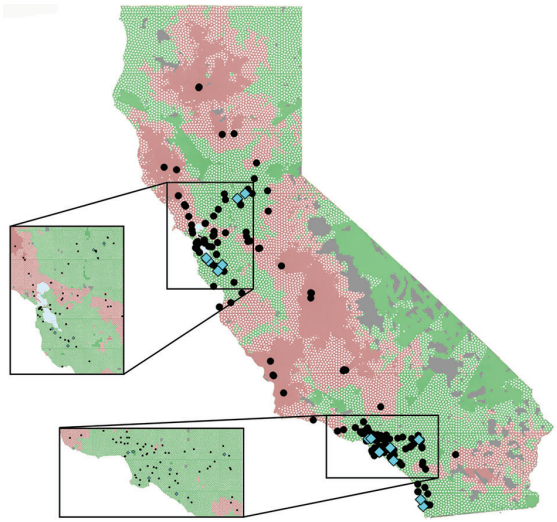
Factor	Time, min
Onset to first medical contact	30
Ambulance response and scene time	30
Door to needle (thrombolysis center)	30
Door in door out	Door-to-needle time + 20
Door to needle (EVT center)	30
Door-to-groin puncture	60 (mothership), 30 (drip and ship)

B Fast at EVT center; slow at thrombolysis centers

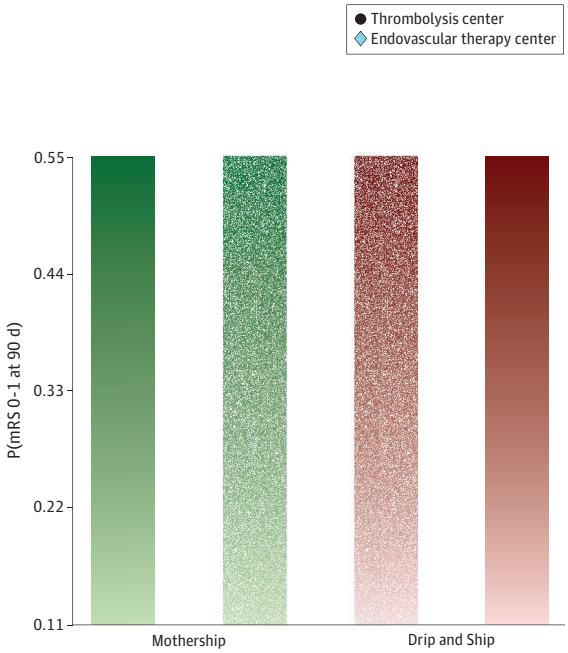


Factor	Time, min
Onset to first medical contact	30
Ambulance response and scene time	30
Door to needle (thrombolysis center)	60
Door in door out	Door-to-needle time + 60
Door to needle (EVT center)	30
Door-to-groin puncture	60 (mothership), 30 (drip and ship)

C Slow at both EVT and thrombolysis centers



Factor	Time, min
Onset to first medical contact	30
Ambulance response and scene time	30
Door to needle (thrombolysis center)	60
Door in door out	Door-to-needle time + 60
Door to needle (EVT center)	60
Door-to-groin puncture	90 (mothership), 60 (drip and ship)



Green indicates mothership estimates the greatest P(mRS 0-1)
Red indicates drip and ship estimates the greatest P(mRS 0-1)
Stippling indicates |P(mRS 0-1|mothership) − P(mRS 0-1|drip and ship)| < .01

Maps depicting the probability of excellent outcome and best predicted transport strategy for patients with suspected ischemic stroke with large-vessel occlusion, defined as Los Angeles Motor Scale Score of 4 or higher in California. In the maps, thrombolysis centers are depicted by black dots and endovascular therapy (EVT) centers are depicted by blue diamonds. A, System with optimized treatment times. B, System with fast treatment at EVT centers but slow treatment at thrombolysis centers. C, System with slow treatment at both thrombolysis and EVT centers. See the caption to Figure 1 for color guide. Gray areas indicate a lack of road infrastructure data; thus, transport times and optimal transport method could not be determined.

thrombolysis center but missed by the prehospital screen. Another consideration is the level of ambulance redundancy in each jurisdiction because mothership transport could leave ambulances out of their home region for longer than typical times. Although beyond the scope of this analysis, the potential volume increase at EVT centers, especially regarding patients with false-positive stroke, should be considered when implementing a transport protocol.

Limitations

There are limitations to the model due to assumptions and available data. We have assumed the ICH treatment outcomes are time invariant; however, patients with ICH may require the higher level of care available at EVT centers (eg, neurosurgical teams and neurointensive care units) and that care may not be time invariant. Conversely, although unproven to date, it remains plausible that hyperacute medical treatment (eg, procoagulant drug <120 minutes from onset) could improve outcomes and, as such, patients might benefit from transport to the nearest stroke center. We have assumed that all patients with LVO will be eligible for EVT. However, this may not be the case and, as further data become available on the association between time and EVT eligibility, the models can be updated.

The treatment of EVT patients will evolve[33] and changes in technology, treatment paradigms, or the use of mobile stroke units may affect the organization of stroke care. As further data become available, these models can be updated. The temporal spatial diagrams are transport-modality agnostic because they are based on transport time—not distance. However, the map of California was generated using ground transport times, and including air transport could change the results. Ground transport times are dependent on time of day and weather patterns. Thus, for jurisdictional planning, health systems may wish to evaluate several scenarios, including some in nonoptimal driving conditions, before deciding on a transport strategy. We used average times for time from onset to first-medical contact and time on-scene, changing these will influence the model results. Finally, we have defined excellent outcome as an mRS score of 0 to 1 at 90 days; using another definition may affect model results.

Conclusions

Decision making for prehospital transport can be modeled using existing clinical trial data. These models are dynamic and can be adapted to different geographies or changing treatment realities. For ischemic stroke with suspected LVO, regional centralization of care is estimated to result in the best outcomes given current average treatment times.

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Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Holodinsky, Williamson.
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Urgent care visits increase as emergency room visits fall, study finds

Visits to the emergency room to treat low-acuity conditions decreased by 36 percent; Use of non-emergency room centers increased by 140 percent.

Healthcare Finance
Jeff Lagasse, Associate Editor
September 7, 2018

Among private health plan enrollees in recent years, there has been a substantial shift from emergency departments to urgent care centers when it comes to patients receiving care for low-acuity conditions, finds new research from Brigham and Women's Hospital.

Treatment for new health problems, or acute care visits, encompass over one-third of all ambulatory care delivered in the U.S. Given the high costs of

emergency departments, many insurance plans have created incentives to encourage patients to receive that care elsewhere.

In response to patient expectations for more convenience, and to long wait times at traditional physician outpatient practices, alternative care facilities such as urgent care centers, retail clinics, and telemedicine have rapidly emerged.

The team of investigators focused on the period between January 2008 and December 2015, examining de-identified data from Aetna, which insured about 20 million members per year during that time.

They found that during those eight years there was a large drop in emergency room visits and a substantial increase in the use of urgent care centers. Retail clinics and telemedicine utilization also increased substantially over that time, but when compared to urgent care centers and emergency rooms, this still accounted for a small number of visits.

Visits to the emergency room for the treatment of these low-acuity conditions decreased by 36 percent, whereas use of non-emergency room centers increased by 140 percent. There was an increase in visits to all other venues, including a 119 percent increase at urgent care centers.

Overall, across all acute care centers, the number of visits increased by 31 percent and spending associated with low-acuity conditions increased by 14 percent. The increase in spending was primarily driven by a 79 percent increase in price per emergency room visit for treatment of low-acuity conditions.

The researchers hypothesize that the reason for this growth is due to the increasing number of urgent care clinics, the familiarity and acceptance of urgent care centers as credible alternative venues among the community, their ability to treat a wide range of conditions, the convenience factor, shorter wait times and lower out-of-pocket costs.

The investigators also found that, among the population of patients with commercial insurance, patients with higher incomes were more likely to use non-emergency room clinics compared to people with lower incomes. Factors

such as transportation and availability of alternative options might be an influence on that care pattern.

The findings suggest that while the overall use of acute care venues for treatment of low-acuity conditions -- and the associated spending -- continues to rise, urgent care centers are becoming the go-to option for growing numbers of people.

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