

Santa Barbara County Trauma System Assessment
EXECUTIVE SUMMARY
By Bishop+Associates
September 15, 2023

Bishop+Associates (B+A) was asked to evaluate the Santa Barbara County (SBC) trauma system and Emergency Medical Service (EMS) triage and transport policies. Specifically, B+A was asked to determine if EMS policy should change to reflect the fact that the trauma system now has both a Level I trauma center (Santa Barbara Cottage Hospital, SBCH) and a Level II trauma center (Marian Regional Medical Center, MRMC). Santa Barbara County (SBC) Emergency Medical Service (EMS) is the local emergency medical services agency (LEMSA) with responsibility to oversee the trauma system for the county.

SBCH received American College of Surgeons (ACS) verification as a Level II trauma center in 2005 and was successfully verified as an ACS Level I trauma center in 2017. SBCH is also designated by the LEMSAs as a Level II pediatric trauma center, with its most recent review and approval occurring in December 2022.

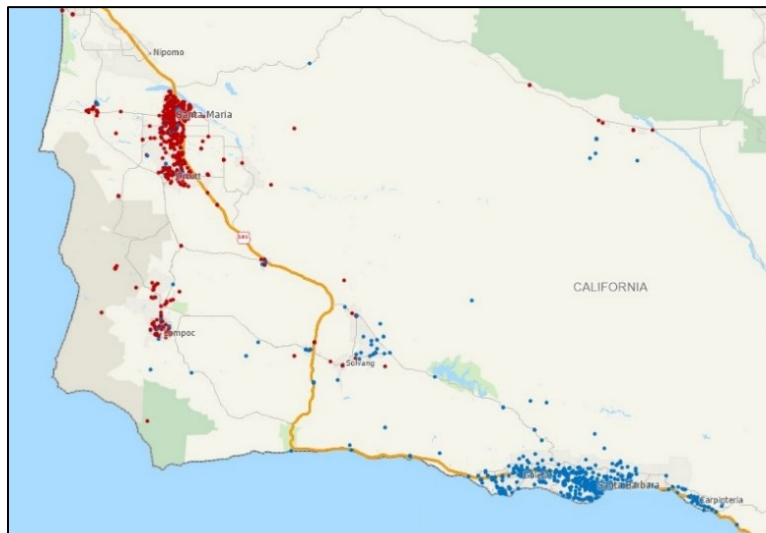
	SBCH	MRMC
Date of ACS Verification Visit	Sept 2021	June 2022
ACS Verification Level	Level I	Level II
Staffed Hospital Beds	242 beds	174 beds
ICU Beds	48	20 (surge to 40)
PICU Beds	8	0
Operating Rooms	14	7
ED Treatment Rooms	46	44
Trauma Resuscitation Bays	4	3
Admitted Trauma Volume 2022	1516	668

In 2013 MRMC was designated by the LEMSAs as a Level III trauma center. In June 2022, the hospital was evaluated by the ACS as a Level II trauma center and received an official letter from the ACS verifying the hospital met the criteria for a Level II trauma center on September 12, 2022. MRMC is a county-designated trauma center but the LEMSAs have not yet changed MRMC's designation to reflect Level II trauma center ACS verification.

There are also three non-trauma hospitals in SBC: Santa Ynez Valley Cottage Hospital, Goleta Valley Cottage Hospital, and Lompoc Valley Medical Center.

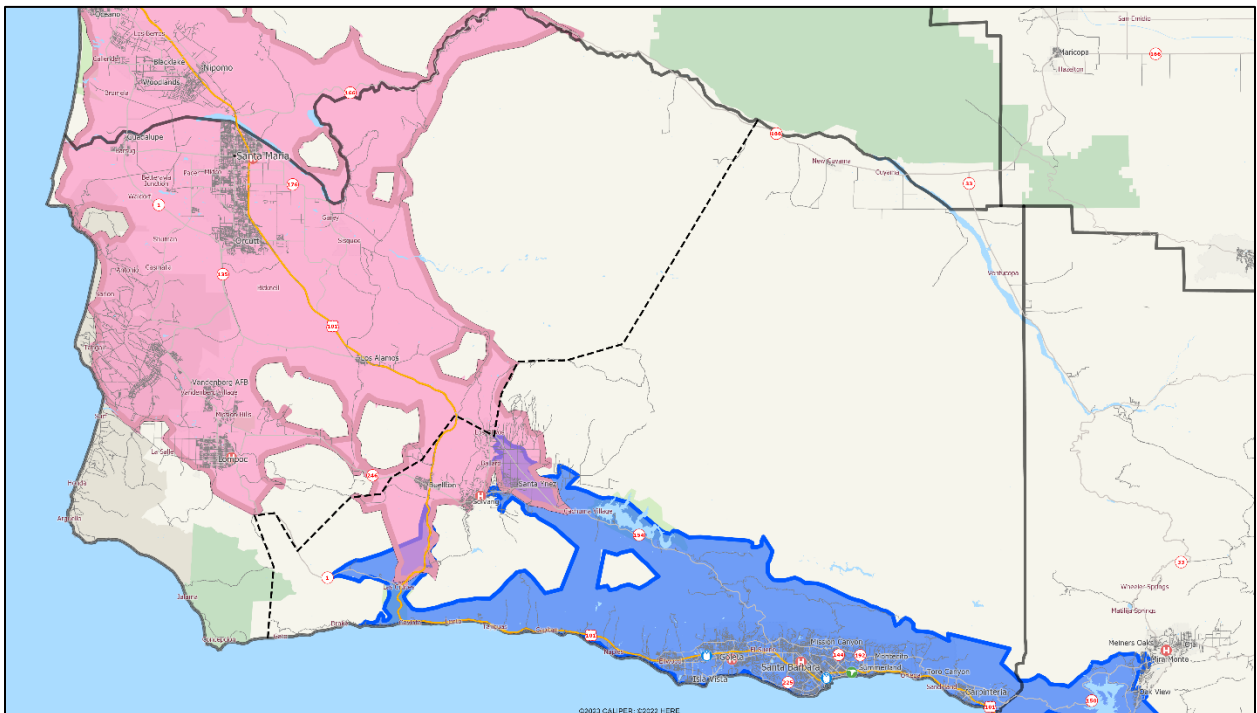
The basic findings of the trauma system assessment are as follows:

- 1. The Santa Barbara County Trauma System is Strengthened.** Santa Barbara County has a population of nearly 450,000 people. The new Level II trauma center at MRMC strengthens the trauma system and provides trauma access to a previously underserved area of the county, as Santa Maria is projected to experience 25% population growth between 2020-2040. The map to the right shows injury locations for trauma center patients in 2022; red dots denote patients transported by EMS from the scene to MRMC and blue dots denote patients transported to SBCH. The map clearly illustrates the need for definitive trauma care in the northern portion of the county.



Previous EMS policy was written when MRMC was a Level III trauma center and lacked advanced surgical specialties required for critically injured patients. To meet revised ACS standards (2022), both trauma centers must have continuous coverage in all required surgical specialties. SBCH has some advanced offerings (e.g., neuro-interventional radiology, specialized intensive care units), but patients requiring those services cannot be identified by EMS in the field. The list of required specialties can be found in the full report.

2. **SBC Has Two Distinct Trauma Service Areas.** The two trauma centers are 60 miles apart and are considered to serve distinct trauma service areas. As shown in the map below, most of the populated areas of the county are within 40 driving minutes of a trauma center. Areas highlighted in pink are within 40 driving minutes of MRMC; areas highlighted in blue are within 40 driving minutes of SBCH. The dotted black line illustrates the current EMS boundary for the North and South Transport Zones.



In reviewing written EMS triage policies for the six LEMSAs in California that have both a Level I and a Level II trauma center, we could not locate any EMS field triage policies that differentiate Level I and Level II trauma centers. All reviewed policies consider the two levels to both be the highest level of trauma care due to their equivalent surgical and clinical requirements.

LEMSA / Region	Level I and II TCs	Distance to Next Closest TC	Policy Differentiates Level I and Level II TCs
Sacramento County (CA)	Yes	6 miles	No
Inland Counties (CA)	Yes	7 miles	No
Santa Clara County (CA)	Yes	8 miles	No
Alameda County (CA)	Yes	13 miles	No
Orange County (CA)	Yes	23 miles	No
Riverside County (CA)	Yes	43 miles	No

We are also unable to identify any EMS policy from outside of California that differentiates the two levels in EMS decisions. A few examples from the western US are noted below.

- In Oregon, state law prescribes transport to the highest level of care within the trauma system, with no differentiation for Level I or Level II trauma centers. The law explicitly lists specific categories of major trauma (including penetrating injuries, spinal cord injuries, traumatic brain injury, and high-grade organ injuries) and does not dictate that patients with these injuries must be transported to a Level I trauma center (OAR Chapter 333, Division 200, Exhibit 5). Oregon has a single Level I trauma center in Portland.
- In the state of Washington, all trauma centers are state-verified rather than ACS-verified. EMS policy for Pierce County (Tacoma) explicitly specifies two injuries that should be transported to the Harborview Medical Center, the Level I trauma center in Seattle (38 miles north of the Level II trauma centers in Tacoma): burns and amputations. Notably, Harborview is the only verified burn center in Washington. Capability for replantation is now a Level I and Level II trauma center requirement in the new ACS standards (4.25) but trauma centers are allowed to transfer select patients to replant centers in the National Hand Trauma Center Network (neither SBCH nor MRMC is in this network).

3. **Special Trauma Populations Should be Considered.** As part of the system assessment, specific trauma populations were defined and outcomes between trauma centers were compared. A full overview of these defined populations is presented in the full report.

- a. **Pediatric Trauma Patients.** There are currently no ACS pediatric trauma centers in SBC and MRMC does not have pediatric trauma resources. When MRMC receives pediatric patients (by ground EMS or patients who arrive by private vehicle) who require trauma center resources, MRMC must transfer them to a pediatric trauma center with appropriate capabilities. In the reviewed data from 2022 and 1st Quarter 2023, most pediatric trauma patients were transferred from MRMC to Valley Children's Hospital, an ACS-verified Level II pediatric trauma center in Madera, California.

SBCH neurosurgeons have agreed to begin providing continuous pediatric neurosurgery coverage, although details of this coverage were not available at the time of this report. Pediatric neurosurgical coverage will be a great asset to the trauma system and will allow injured children to receive trauma care within the county. SBC has designated SBCH as a county-designated Level II pediatric trauma center. It is unclear at the time of this report if SBCH will pursue ACS verification as a Level II pediatric trauma center.

- b. **Trauma Surgery.** At both hospitals, the trauma surgeon responds to all Tier 1 activations and is available for Tier 2 activations per the request of the ED physician, resident, and/or trauma advanced practice provider.
- c. **Neurotrauma.** Both trauma centers have continuous neurosurgery coverage and qualified neurosurgeons. SBCH has four board-certified neurosurgeons and a very strong neuroscience program, including neuro-interventional radiology and a concussion clinic for mild TBI management. MRMC has two board-certified neurosurgeons who share neurosurgery emergency call. In the Verification Report from the ACS (2022), reviewers noted that the neurosurgeons at MRMC were "strong advocates for and participants in

the trauma program” and that “neurosurgeons are clinically aggressive and wish to be involved early in the treatment of all severe head injuries.”

- d. **Landing Zone Patients.** Due to the current EMS triage policy in SBC, some patients injured in the North and meeting specific triage criteria have historically been driven to MRMC and then flown to SBCH. These patients are not evaluated at MRMC and MRMC ED/trauma staff are not informed of their arrival or status. In January 2022-March 2022, 20% of adult patients (13 of 65) and 15% of pediatric patients (2 of 15) were flown to SBCH and discharged home from the ED. While these percentages are within the acceptable range for trauma center overtriage, this process adds significantly to patient transport time and does not reflect MRMC’s current ability to provide definitive trauma care for patients injured in the North.

Conclusions and Recommendations

The two trauma centers have both been verified by the ACS. While current EMS triage procedures were suitable for the trauma system when MRMC was a Level III trauma center, the procedures do not reflect current practice in other California LEMSAs or other regions of the country. SBCH and MRMC are both capable of providing definitive care for injured patients. Definitive care includes the ability of a hospital to admit, treat and discharge, or stabilize and transfer, a trauma patient.

After reviewing data and reports from both hospitals and engaging in collaborative conversations with key stakeholders, B+A has the following conclusions and recommendations.

1. **Implement a Level I – Level II Adult Trauma System.** The county should be divided into equal halves based on transportation and geographic parameters and EMS should be empowered to take adult patients (ages 15 years and older) to the closest trauma center. The suggested division is shown in green on the map below, with boundaries following major roads to aid EMS in the field, but final boundaries should be established collaboratively by county EMS stakeholders. The current EMS North/South Transport Zones are delineated by a black dotted line.



2. **Define a Pediatric Trauma Service Area (TSA).** Given that the two trauma centers have differing pediatric trauma resources, a pediatric TSA should be created. If the scene of injury is within 20 driving minutes of MRMC, the patient should be transported by ground EMS to MRMC. If the scene of injury is within driving distance of SBCH or the patient requires air transport, the patient should be transported to SBCH.

The policy should mitigate the chance of a pediatric patient being flown twice; the helicopter should be used to transport the patient to definitive pediatric care. SBC stakeholders should work collaboratively to refine EMS field triage criteria to capture patients that require transport directly to SBCH and determine if the current step criteria will be revised.



3. **Moderate Use of Air EMS.** Air EMS is an essential resource to a trauma system and CALSTAR reports positive working relationships with both trauma centers. A revised EMS triage policy will result in reduced helicopter utilization, and ongoing efforts should evaluate the appropriate use of air EMS resources. The trauma centers should continue to work closely with ground EMS agencies when air transport is unable to fly due to weather. Patient need for two helicopter transports (initial transport to trauma center and second transport to higher level of care) should be rare.
4. **Reaffirm Patient Choice.** When possible, patient preference should be considered when transporting patients from the Central Valley. This is particularly the case if the patient currently receives care in the Cottage Health System. Transport to SBCH should be considered to ensure access to historical medical records and proximity to follow-up care.
5. **Increase Collaboration.** Trauma is, by nature, a collaborative discipline, requiring the trauma centers, county leadership, and EMS agencies to work together as a system to achieve the best possible outcomes for injured patients. There is a need for increased collaboration between the hospitals and within the regional trauma system in four primary areas:
 - a. **Transfers (Including Pediatrics).** Hospitals can establish transfer agreements and relationships with trauma centers of their choosing, but it is in the best interest of patients and their families to receive definitive care as close to home as possible. Moving forward, both trauma centers are committed to optimizing both parts of the transfer process, for both adult and pediatric patients. For MRMC, this includes rapid recognition of patients requiring a higher level of care and initiation of contact with SBCH when transfer is needed. For SBCH, this includes targeted efforts to minimize delays in acceptance of transfers and work with MRMC to provide feedback and updates on patient outcomes after transfer.
 - b. **Injury Prevention and Disaster Planning.** As the Level I trauma center and leader of the trauma system, SBCH is committed to helping MRMC enhance injury prevention offerings in the North by contributing training, equipment, and resources in support of MRMC. The TPMs

at both hospitals, along with their injury prevention specialists, should identify opportunities to increase and expand collaboration specifically for children (e.g. car seat installation checks, crib safety, bike helmets) and the elderly (e.g. Master of Balance and fall prevention activities, safe home assessments).

- c. **Performance Improvement.** As a trauma system, SBC EMS should continue to facilitate collaboration in data sharing and performance improvement initiatives. As the trauma system evolves into the new model, it will be important for SBC EMS to continue monitoring key metrics of the transfer process, including time to transfer decision (MRMC) and time to transfer acceptance (SBCH), and work with both hospitals to identify barriers to this process.
- d. **Education.** The trauma centers should individually and collectively provide ongoing trauma education for EMS personnel and non-trauma hospital providers to ensure understanding of triage criteria and to provide loop closure and opportunities for improvement on difficult patient cases. This can include case study reviews with specific EMS agencies, as well as formal EMS provider education.

Projected Volume Changes

While the above recommendations regarding adult and pediatric EMS triage will be a shift from current practice, it is expected that these changes will not have a dramatic influence on patient volumes at either trauma center. SBCH will see a reduction in pediatric patients transported from the scene of injury in the North, but this will be offset by the new ability to accept more pediatric transfers from MRMC and other hospitals in the region due to plans for increased pediatric neurosurgery coverage. Proposed revisions to EMS policy will ensure that the pediatric patients transported or transferred to SBCH truly need the resources of a pediatric trauma center.

B+A projects a shift of 50-70 admitted adult trauma patients per year who were formerly transported from the scene to SBCH but could now receive all their trauma care at MRMC. This will provide a 7-10% increase in trauma admissions at MRMC and a 3-5% reduction in trauma admissions at SBCH. At this time, it is not anticipated that this shift in EMS triage practices will affect SBCH's ability to maintain the minimum volumes for a Level I trauma center (1200 annual admissions).



SANTA BARBARA COUNTY TRAUMA SYSTEM ASSESSMENT REPORT

BY BISHOP+ASSOCIATES

FINAL REPORT – SEPTEMBER 12, 2023

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I. INTRODUCTION

Santa Barbara County (SBC) Emergency Medical Service (EMS) is the local emergency medical services agency (LEMSA) with responsibility for overseeing the trauma system. Santa Barbara Cottage Hospital (SBCH) has been a Level I trauma center since 2017, and in 2022 Marian Regional Medical Center (MRMC) requested and received verification from the American College of Surgeons (ACS) as a Level II trauma center. Bishop+Associates (B+A) has been engaged by Santa Barbara County EMS to complete an independent assessment of the SBC trauma system trauma patient triage policy, with a key focus on the field triage criteria and process that directs air medical transports to the appropriate trauma center. According to California Law (CA Health & Safety Code §1798.165 (2016)), SBC EMS has responsibility for overall trauma system monitoring, EMS policies and procedures, and designation of trauma centers as part of the trauma system.

B+A WORKPLAN

B+A was asked to work within the following scope:

1. **Collaboration.** Conduct a collaborative process that thoroughly engages stakeholders, maintains communication and feedback, and informs stakeholders as findings develop.
2. **Assessment.** Evaluate key trauma system factors that impact EMS triage policy by reviewing and analyzing available datasets, assessing current and future population characteristics of SBC, and examining current transport times within the trauma service areas. B+A was also asked to review the confidential ACS reports and registry data for both trauma centers to profile capabilities and admission/transfer practices at both facilities.
3. **Research.** Review existing SBC EMS policy and research best practice and national field triage criteria. Specifically, B+A was asked to review triage policies from similar LEMSAs or states to determine how other agencies specify triage criteria when at least one Level I and Level II trauma center is present in the system.
4. **Recommendations.** Summarize the impact of recommendations on both trauma centers and prepare draft recommendations for policy changes for feedback and implementation.

REPORT ORGANIZATION

This report is divided into five sections:

- I. **Introduction to Project and Guiding Assumptions.** Provide a summary of the workplan and project objectives, along with assumptions that guide the evaluation and recommendation process.
- II. **Describe Santa Barbara County Trauma System, Trauma Center Characteristics, and EMS Transport Patterns.** Provide an overview of the Santa Barbara County trauma system

and its two trauma centers. Describe population trends for the region, as well as current EMS transport patterns.

- III. **Define Patient Populations Potentially at Risk.** Identify patients who could be adversely affected by changes in EMS triage and describe the resources utilized and clinical outcomes for these patient populations. *Any confidential data will be reported in Appendix C, which will only be delivered to trauma centers and EMS leadership.*
- IV. **Discuss Field Triage Processes in Other Regions.** Review current field triage processes and identify possible solutions to the field triage process.
- V. **Provide Recommendations for the Future.** Advise Santa Barbara County EMS on options for EMS triage and air transport of trauma patients.

PROJECT TIMELINE AND REPORT DELIVERY

The project was completed within 3 months of receipt of data. The timeline was as follows:

- The contract between SB EMS and B+A was initiated on March 21, 2023, approved by the SBC fiscal department on April 7, 2023, reviewed by the SBC Data Sharing Committee on May 3, 2023, and approved on May 12, 2023.
- Data requests were placed with each hospital on April 7, 2023. The two trauma centers executed data sharing agreements and sent the requested data to B+A on May 31, 2023.
- Throughout the project, B+A met with trauma leaders at both trauma centers.
- B+A presented data findings to the SBC Trauma System Improvement Committee on July 20, 2023.
- B+A, along with SBC EMS leadership, met with CALSTAR on August 2, 2023, to discuss and refine preliminary recommendations for air EMS.
- Recommendations were shared with SBC EMS leadership on August 14, 2023.
- A draft of the report and final recommendations were delivered to SBC EMS and trauma center leadership on August 18, 2023.
- A presentation of final recommendations was given to SBC EMS leadership, EMS providers, and trauma center leaders on August 31, 2023.

GUIDING ASSUMPTIONS

Several assumptions were made in regards to the following analyses and recommendations. First, the ACS standards and process for verification are considered the gold standard for trauma center designation. When a hospital passes their verification with no deficiencies, the ACS has determined that the hospital meets the minimum criteria as presented in *Resources for the Optimal Care of the Injured Patient*.

Second, Level I trauma centers have more resources than Level II trauma centers. This is due to a variety of factors, including the presence of general surgery residency (and fellowship) training programs, larger trauma volumes, involvement in scholarly research, and involvement in regional and national trauma organizations. For a limited number of injury patterns, Level I trauma centers provide superior care and survival benefit to trauma patients. (See Appendix A for a select list of research studies supporting this survival benefit.) However, both levels of trauma center are considered the highest level of trauma care when considering EMS triage destination and initial evaluation of trauma patients. (See Section IV.)

Third, a strong trauma system is essential for ensuring patients can be evaluated and treated as quickly as possible. Trauma systems have existed for four decades and work best when trauma centers collaborate. It is appropriate for a Level I trauma center to be a leader in trauma system issues and for hospitals in the region to share training, injury prevention initiatives, performance improvement, and commitment to providing the best care for trauma patients.

Finally, national guidance on field triage criteria is purposefully vague to accommodate different geographies and challenges within trauma systems across the country. Ultimate EMS triage decisions and protocol should be based on an accurate understanding of the capabilities of trauma centers and should reflect the geographic/distance, weather, and injury patterns that characterize SBC.

II. SANTA BARBARA COUNTY TRAUMA SYSTEM

OVERVIEW OF THE TRAUMA SYSTEM

Santa Barbara Cottage Hospital (SBCH) is a 242-bed hospital in Santa Barbara. In 2001 it was designated by the LEMSA as a Level II trauma center. In 2005 the hospital received ACS verification as a Level II trauma center and in 2017 it became an ACS Level I trauma center. SBCH is also

designated by the LEMSA as a Level II pediatric trauma center, with its most recent review and approval occurring in December 2022.

	SBCH	MRMC
Trauma Campus Location	Santa Barbara	Santa Maria
Date of Last ACS Verification Visit	Sept 2021	June 2022
ACS Verification Level	Level I	Level II
Staffed Hospital Beds	242 beds	174 beds
ICU Beds	48	20 (surge to 40)
Pediatric ICU Beds	8	0
Operating Rooms	14	7
ED Treatment Rooms	46	44
Trauma Resuscitation Bays	4	3

In 2013 Marian Regional Medical Center (MRMC) was designated by the LEMSA as a Level III trauma center. In June 2022, the hospital was evaluated by the ACS as a Level II trauma center and received an official letter from the ACS verifying the hospital met criteria for a Level II trauma center on September 12, 2022. MRMC is a county-designated trauma center, but the LEMSA has not yet changed MRMC's designation to reflect Level II trauma center ACS verification.

The table below shows the admitted volume by Injury Severity Score (ISS) for each trauma center, as well as the number of patients who went directly to the Operating Room (OR) from the Emergency Department (ED).

	SBCH		MRMC	
Injury Severity Score (ISS)	Admitted	ED to OR	Admitted	ED to OR
Minor ISS 0-8	742	63	315	14
Moderate 9-15	572	53	286	21
Major ISS 16-24	146	20	40	4
Severe ISS 25+	56	17	27	7
Total	1516	153	668	46

There are also three non-trauma hospitals in SBC: Santa Ynez Valley Cottage Hospital, Goleta Valley Cottage Hospital, and Lompoc Valley Medical Center.

SANTA BARBARA COUNTY POPULATION

SBC includes 8 incorporated cities; Santa Maria is the most populated city in the county. According to the US Census Bureau, there were 448,217 people residing in SBC in 2020, and the

Santa Barbara County Association of Governments has projected the county to have 513,300 residents by 2040, representing a 14.5% increase from 2020 Census levels. The largest population increases are projected for Santa Maria and Buellton.

Municipality	Census 2010	Census 2020	2010-2020 % Change	Projection 2040	2020-2040 % Change
Buellton	4,828	5,161	6.9%	6,400	24.0%
Carpinteria	13,040	13,264	1.7%	14,600	10.1%
Goleta	29,888	32,690	9.4%	34,300	4.9%
Guadalupe	7,080	8,057	13.8%	8,900	10.5%
Lompoc	42,434	44,444	4.7%	51,300	15.4%
Santa Barbara	88,410	88,665	0.3%	101,100	14.0%
Santa Maria	99,553	109,707	10.2%	139,000	26.7%
Solvang	5,245	6,126	16.8%	6,300	2.8%
Unincorporated	133,417	140,115	5.0%	151,300	8.0%
Total	423,895	448,229	5.7%	513,300	14.5%

SANTA BARBARA COUNTY EMS

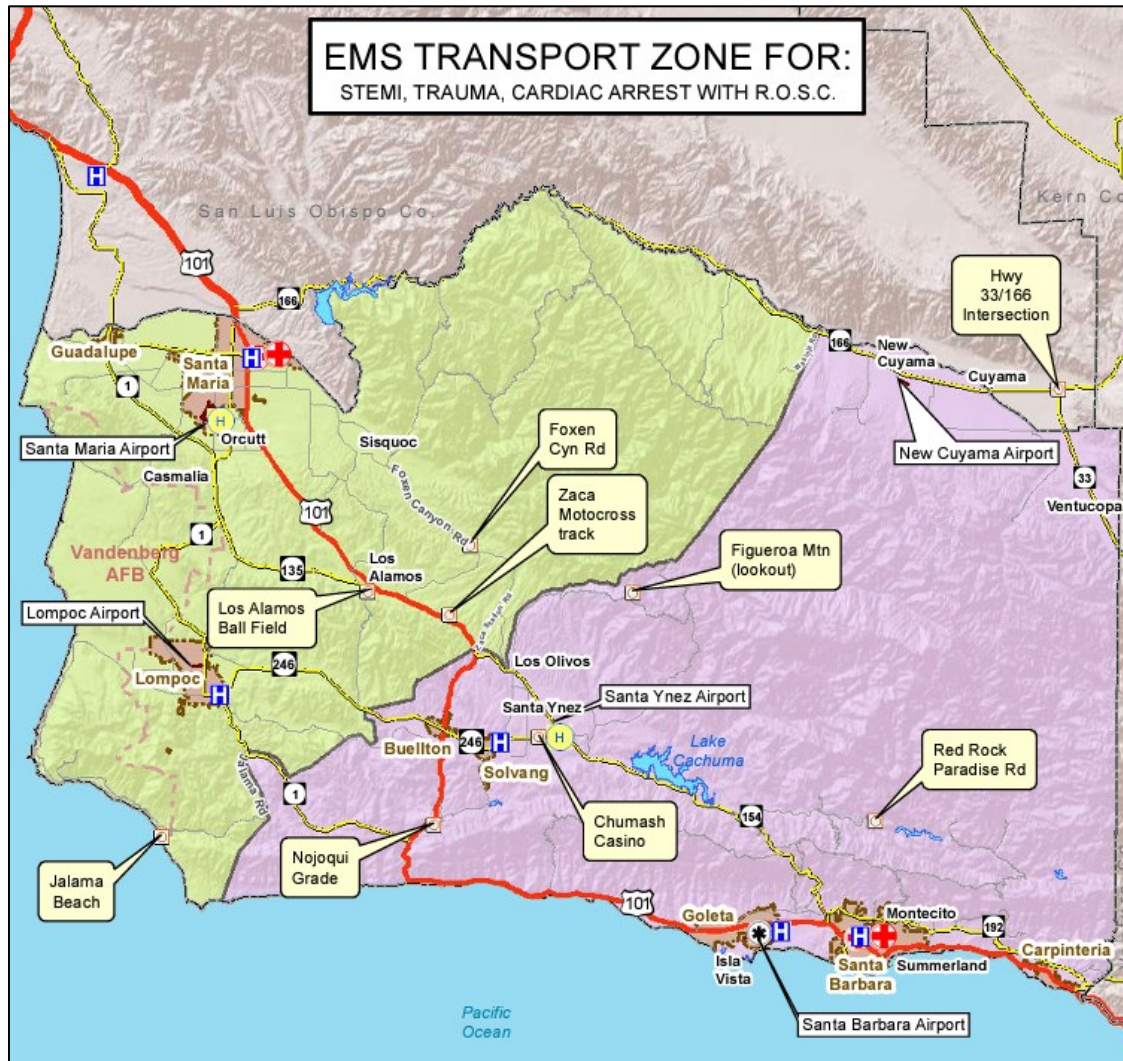
SBC has three primary EMS providers for ground and air medical transport: American Medical Response, CALSTAR, and Santa Barbara County Fire. The table below shows the number of times each agency responded to the scene of a trauma in 2022, as well as the number of transports to each trauma center. The numbers exclude transports to non-trauma hospitals in SBC, squads that were at the scene but the patient was transported by another agency, and transports to the landing zone at MRCM or the Santa Maria Airport.

EMS Agency	Scene Responses	Transport to SBCH	Transport to MRCM
American Medical Response	1272	593	610
CALSTAR	110	89	21
Santa Barbara County Fire	179	35	44

CURRENT SBC EMS ZONES

Santa Barbara County currently has two EMS transport zones for STEMI, Trauma, and Cardiac Arrest. The North Transport Zone (green shading in the map below) includes Santa Maria, Guadalupe, Lompoc, and unincorporated areas. The South Transport Zone (pink shading) includes Santa Barbara, Buellton, Carpinteria, Goleta, Solvang, and unincorporated areas. The two zones are separated by a line that extends from the intersection of Highway 1 and Jalama Road in Lompoc, through the intersection of Highway 101 and Hwy 154, to Highway 166 west of New Cuyama at Wasioja Road. The transport zones were last revised in 2012.

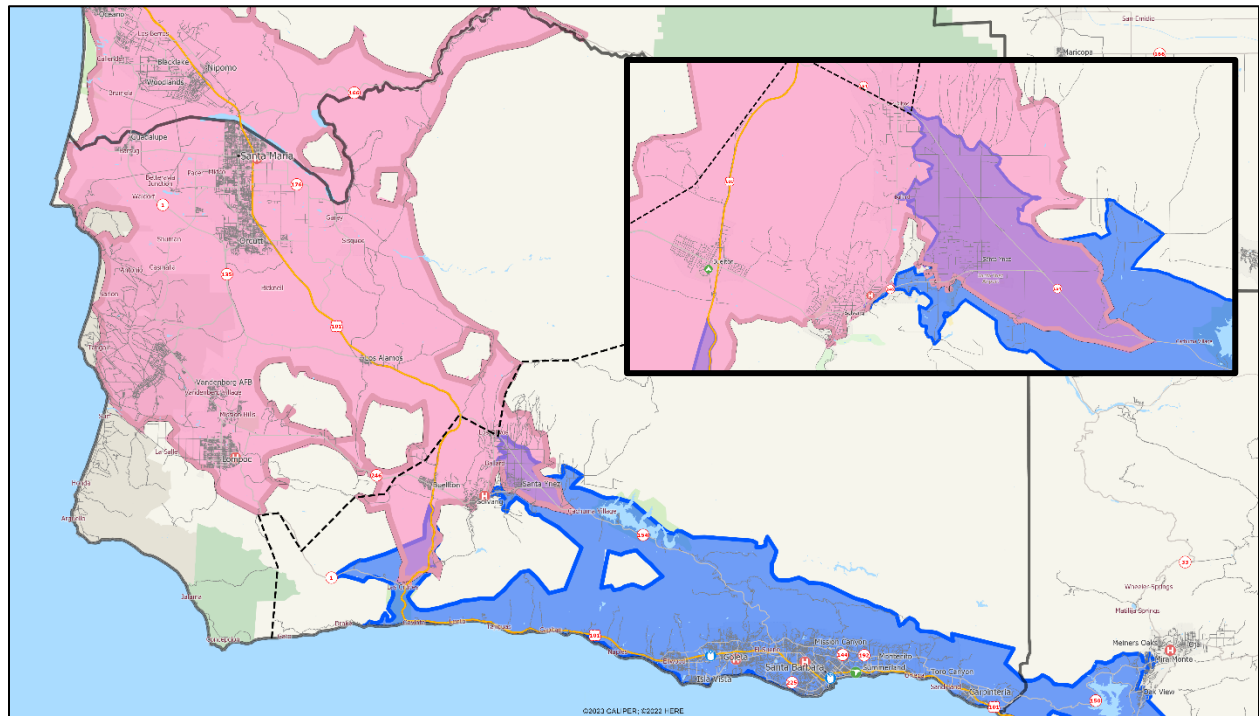
EMS providers are instructed to transport STEMI and cardiac arrest patients to the facility in the Zone in which the event occurred. Most trauma patients are transported to the facility in the Zone in which the event occurred; however, patients who meet specific clinical criteria are flown by air EMS to SBCH. More information on current EMS policy is described below.



SBC DRIVE-TIME RINGS

B+A utilized Mapitude mapping software (Caliper Corporation, 2023) to identify regions within 40 driving minutes of each hospital; 40 miles was selected through trial and error to determine where the two drive-ring areas would meet. The software's drive-time analysis program uses streets and approximate driving times based on road characteristics, such as speed limits. The output of drive-time rings differs significantly from more simplistic rings that define areas based on straight-line ("as the crow flies") distances.

In the map on the following page, areas shaded in pink are within 40 driving minutes of MPMC and areas shaded in blue are within 40 driving minutes of SBCH. The black dotted line represents the current North-South Transport Zone boundary.



As shown in the map insert, the municipalities of Solvang, Buellton, and Santa Ynez are within the 40-minute drive ring of MPMC. This area, however, is currently in the South EMS Transport Zone. This region will be defined as the Central Valley Transport Zone, and patients injured in this region will be included in analyses to determine if SBC EMS should consider moving the line between the two zones.

EMS TRAUMA FIELD TRIAGE PRACTICE - CURRENT

The current EMS Transport Zones described above were delineated in 2002 and last revised in 2012. EMS Triage Practice was drafted in 2002 and last reviewed in 2018 when SBCH became a Level I trauma center (when MPMC was a Level III trauma center).

The current policy dictates that adult patients injured in the North Zone and meeting physiologic or anatomic triage criteria should be transported by air ambulance to SBCH. Additionally, pediatric patients (less than 15 years of age) injured in the North Zone and meeting physiologic, anatomic, or mechanism triage criteria should be transported by air ambulance to SBCH. Adult patients meeting mechanism criteria can be transported by ground to the closest trauma center and any patient with an obstructed airway should be transported to the closest hospital. If an air ambulance is unavailable due to weather or the helicopter is already in service, patients are transported to the closest trauma center.

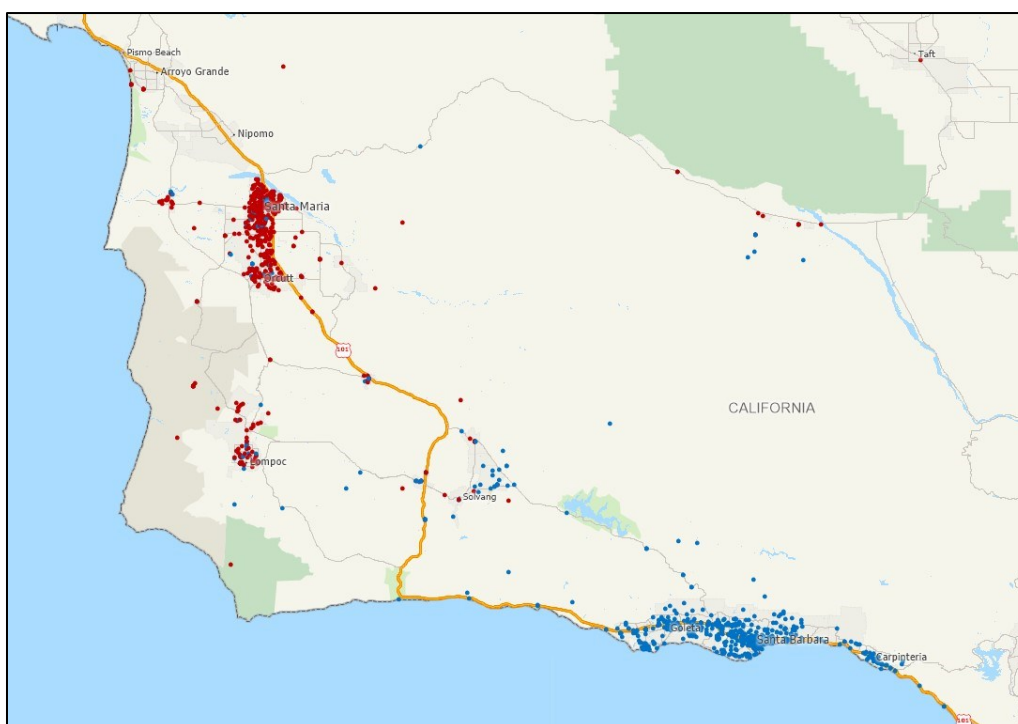
EMS TRANSPORT TIMES

For ground and air transport from the scene, transport times were calculated as minutes between EMS arrival at the scene and patient arrival at the trauma center. Transport times are shown in the table below.

	SBCH		MRMC	
	Ground (N=633)	Air (N=89)	Ground (N=654)	Air (N=21)
Average Transport Time, in Minutes	0:26	0:49	0:26	0:25

INJURY LOCATIONS

After importing 2022 SBC EMS data into Maptitude, injury location was mapped for every patient that required EMS transport to a trauma center. Injury locations are shown on the map below.



For most transports, patients in the North Transport Zone were transported to MRMC (red dots on the map) and patients in the South Transport Zone were transported to SBCH (blue dots). However, blue dots in the North Transport Zone show instances where patients were injured in the North Transport Zone and transported to SBCH. This could occur via air transport directly from the scene of injury or when the patient was transported by ground EMS to the Santa Maria Airport or the helipad at MRMC and then transported by air to SBCH.

III. PATIENT POPULATIONS AND OUTCOMES

In this section, we describe characteristics and outcomes of identified patient populations who could be adversely affected by a change in EMS triage criteria. ***Confidential data are reported in Appendix C, which will only be delivered to the trauma centers and EMS leadership.***

Several data sources were used for these analyses:

- Trauma registry data for both trauma centers, January 2022 through March 2023.
- Pre-review Questionnaires (PRQ) completed by each trauma center in preparation for their most recent ACS site visit. The SBCH reporting period was July 2020-June 2021; the MRMC reporting period was April 2021-March 2022.
- ACS Verification Reports for each trauma center, reporting on the most recent site visit.
- Data from Spring 2023 Trauma Quality Improvement Program (TQIP) reports for each trauma center, with a reporting period of 1st Q 2021 through 3rd Q 2022.
- EMS data provided by Santa Barbara County EMS, January 2022 through March 2023. Data included patients who received a 911 response with trauma triage, injury triage criteria, trauma center triage criteria (Steps 1 and 2), or primary impression of burn, traumatic arrest, or traumatic injury.

Both hospitals were last reviewed according to the 2014 standards in *Resources for the Optimal Care of the Injured Patient* (the “orange book”). The 2022 standards (the “gray book”) will be applicable in the next verification cycles, therefore those standards are referenced in this section of the report.

PEDIATRIC TRAUMA PATIENTS

The pediatric trauma population includes children less than 15 years of age included in the trauma registry. This age was selected as it meets the ACS definition of “pediatric.” Current SBC EMS policy indicates that pediatric patients (< 15 years of age) meeting Step One (physiologic), Step Two (anatomic), or Step Three (mechanism) criteria will be transported to SBCH by air ambulance.

There are currently no ACS pediatric trauma centers in SBC and MRMC does not have pediatric trauma resources. When MRMC receives pediatric patients (by ground EMS or patients who arrive by private vehicle) who require trauma center resources, MRMC must transfer them to a pediatric trauma center with appropriate capabilities. In the reviewed data from 2022 and 1st Quarter 2023, most pediatric trauma patients were transferred from MRMC to Valley Children’s Hospital, an ACS-verified Level II pediatric trauma center in Madera, California.

SBCH neurosurgeons have agreed to begin providing continuous pediatric neurosurgery coverage, although details of this coverage are not available at the time of this report. Pediatric neurosurgical coverage will be a great asset to the trauma system and will allow injured children

to receive trauma care within the county. SBC has designated SBCH as a county-designated Level II pediatric trauma center. It is unclear at the time of this report if SBCH will pursue ACS verification as a Level II pediatric trauma center.

PEDIATRIC TRAUMA PATIENT OVERVIEW

The table below shows the characteristics of pediatric trauma patients at both hospitals in 2022, presented by mode of arrival.

2022 PEDIATRIC TRAUMA PATIENTS BY MODE OF ARRIVAL						
	Total Patients	ED Discharge Home	Mortality	Transfers Out	Admissions	ED to OR
SBCH	91	29	1	5	56	14
Private	34	8	0	2	24	5
Ground EMS	46	19	1	1	25	8
Air EMS	11	2	0	2	7	1
MRMC	130	70	2	27	31	3
Private	67	37	0	18	12	0
Ground EMS	63	33	2	9	19	3
Air EMS	0	0	0	0	0	0

In 2022, SBCH had 91 total pediatric patients in the trauma registry; 51% arrived by ground EMS, 37% arrived by private vehicle, and 12% arrived by air EMS. Nearly one-third of these patients were discharged home from the ED and 15% of patients went immediately to the OR from the ED.

In 2022, MRMC had 130 total pediatric patients in the trauma registry; 48% arrived by ground EMS and 52% arrived by private vehicle. More than one-half of patients were discharged home from the ED and 21% of patients were transferred to a pediatric trauma center.

PEDIATRIC TRAUMA PATIENT SUMMARY

After reviewing all EMS and trauma registry data for pediatric trauma patients, we can conclude:

- MRMC was quick to receive and evaluate pediatric patients. When a higher level of care was required, MRMC promptly arranged for transfer to a pediatric trauma center with appropriate capabilities.
- It was very rare for pediatric patients at either hospital to have life-threatening injuries or require critical trauma resources, such as the highest level of trauma activation in the ED or a bed in the Pediatric ICU.

TRAUMA PATIENTS REQUIRING SURGICAL INTERVENTION

In the 2022 ACS standards for trauma centers, Level I and Level II centers have nearly identical requirements for continuous (24/7/365) surgical and medical specialty coverage. As shown in the table below, Level II trauma centers are not required to have craniofacial surgery or replantation capability, but MRMC does have 24/7 craniofacial surgical coverage through Oral Maxillofacial Surgery and otolaryngology.

Surgical Service/Capability	Level I Trauma Centers	Level II Trauma Centers
Trauma	X	X
Orthopedic Surgery	X	X
Neurosurgery	X	X
Cardiothoracic Surgery	X	X
Hand Surgery	X	X
Interventional Radiology	X	X
Obstetrics/Gynecology Surgery	X	X
Ophthalmology	X	X
Otolaryngology	X	X
Plastic Surgery	X	X
Urology	X	X
Vascular Surgery	X	X
Replantation Services	X	X
Craniofacial Surgery	X	*
Soft Tissue / Microvascular Expertise	X	

In terms of trauma staffing, 2 of 9 surgeons at SBCH and 2 of 6 surgeons at MRMC have completed a fellowship in critical care. The ACS requires the Trauma Medical Director (TMD) to be fellowship trained but it is not required for trauma surgeons to be critically care boarded at either level of trauma center. At both hospitals, the trauma surgeon responds to all Tier 1 activations and is available for Tier 2 activations per the request of the ED physician, resident, and/or trauma advanced practice provider.

TRAUMA SURGERY

Trauma surgeons at both hospitals take trauma call and emergency general surgery call. Trauma has become increasingly non-operative over the years, so trauma surgeons participate in emergency general surgery call to maintain their surgical skills. The table below shows the cumulative number of operative procedures at the two trauma centers for general surgeons performing at least 4 trauma procedures in the 12-month reporting period. This could include patients going directly from the ED to the OR for emergent intervention or patients who received an operative procedure after admission to the hospital. Data were derived from the most recent PRQs for both hospitals.

TRAUMA SURGEON SURGICAL CASES		
	SBCH (7 surgeons)	MRMC (4 surgeons)
Total Trauma Operative Cases Per Year (All Surgeons Combined)	152	84
Total Non-trauma Operative Cases Per Year (All Surgeons Combined)	1147	1238
Trauma Surgeon Compliance with Tier 1 15-Minute Response Time	95%	93%

Trauma centers track compliance with the requirement that the trauma surgeon arrives at the patient's bedside within 15 minutes of patient arrival for Tier 1 activations. Trauma centers must show that this occurs for at least 80% of Tier 1 activations. During the PRQ review periods, this was achieved for 95% of Tier 1 activations at SBCH and 93% of Tier 1 activations at MRMC.

SURGICAL SUBSPECIALTIES

In addition to trauma surgeons, trauma patients frequently require neurosurgical or orthopedic surgery. Descriptions of the services are listed below.

NEUROTRAUMA PATIENTS

Patients with severe traumatic brain injuries (TBI) benefit from prompt evaluation and surgical intervention. Research has demonstrated that TBI patients benefit from care at designated trauma centers as compared to lower-level trauma centers or non-trauma hospitals, thus the current SBC EMS triage criteria was appropriate when MRMC was a Level III trauma center and did not have neurosurgical resources. Currently, neither trauma center admits neurosurgical patients under the age of 18, but neurosurgeons will provide emergent interventions (such as craniotomy) prior to transfer if needed. (As indicated above, SBCH is expected to have pediatric neurosurgical coverage soon and will admit pediatric neurosurgical patients to the hospital.)

Per the ACS criteria, both Level I and II trauma centers are required to have 24/7/365 coverage with board-certified neurosurgeons. Under the revised (2022) ACS standards, neurosurgeons are expected to respond within 30 minutes of request to evaluate patients with severe TBI (Glasgow Coma Scale [GCS]<9 with evidence of intracranial trauma on head computed tomography (CT) scan), moderate TBI (GCS 9-12) with head CT evidence of potential intracranial mass lesion, neurological deficit from potential spinal cord injury, and at the discretion of the trauma surgeon.

SBCH has four board-certified neurosurgeons and a very strong neuroscience program, including neuro-interventional radiology and a concussion clinic for mild TBI management. The hospital is also a certified comprehensive stroke center and has inpatient and outpatient rehabilitation services for patients with brain and spinal cord injuries.

MRMC has two board-certified neurosurgeons who share neurosurgery emergency call. In the Verification Report from the ACS (2022), reviewers noted that the neurosurgeons at MRMC were

“strong advocates for and participants in the trauma program” and that “neurosurgeons are clinically aggressive and wish to be involved early in the treatment of all severe head injuries.” If patients require neuro-interventional radiology or other highly specialized neurotrauma services, MRMC should be quick to recognize and initiate the transfer process; MRMC has an internal benchmark of 30 minutes for time to decision for transfer.

ORTHOPEDIC PATIENTS

SBCH has one trauma-trained orthopedic surgeon and MRMC has two trauma-trained orthopedic surgeons. Having a traumatologist for complex orthopedic injuries is a Level I trauma center requirement but not a Level II trauma center requirement. Both hospitals have occasions where they must transfer a complex orthopedic patient to another trauma center when their trauma-trained orthopedic surgeon(s) is on vacation or encumbered.

The hospitals are each supported by a full panel of orthopedic surgeons. In the most recent Verification Report, reviewers indicated that SBCH has “great outcomes for elderly patients” and indicated no deficiencies or weaknesses regarding orthopedic surgery. In the most recent Verification Report for MRMC, reviewers indicated that there is “significant institutional commitment and improved availability of operating room teams and equipment for the orthopaedic team.”

SURGICAL PATIENT SUMMARY

After reviewing the data from both trauma centers, we can conclude:

- Both trauma centers have qualified panels of surgeons, and neither hospital had any deficiencies related to surgical services in their most recent ACS verification visits.
- From time to time, both hospitals must transfer patients to other trauma centers for a higher level of care or because their surgical specialists are encumbered. Expedious transfer is a priority at MRMC, with a time to transfer benchmark of 30 minutes.
- The hospitals have opportunities to provide back-up to the other trauma center for specialized surgical coverage.

LANDING ZONE PATIENTS

Due to the current EMS triage policy in Santa Barbara County, patients injured in the North Transport Zone and meeting specific triage criteria are driven to MRMC and then flown to SBCH. These patients are not evaluated at MRMC and MRMC ED/trauma staff are not informed of the

patients' arrival or status. Twenty percent of patients who were flown from the North or Central Valley to SBCH between January 2022 through March 2023 were discharged home from the ED and 60% were severely injured and required direct disposition to the OR or admission to the ICU. The average length of stay (LOS) for landing zone patients was 7.4 days.

LANDING ZONE TRAUMA PATIENTS BY INJURY LOCATION (1 st Q 2022 – 1 st Q 2023)									
	Total	Home	ED to OR	Transfer Out from ED	Admit to Floor	Admit to ICU	LOS	ICU	ISS
Santa Maria/Orcutt	42	10	9	0	7	16	7.6	2.7	12
Guadalupe	5	0	0	0	2	3	9	2.6	11
Lompoc	14	3	2	2	2	5	6	3.2	9
Solvang/Buellton	4	0	1	0	1	2	8	6.5	13
TOTAL	65	13	12	2	12	26	7.4	3.0	11

LANDING ZONE PATIENT SUMMARY

After reviewing the data from both trauma centers, we can conclude:

- Current EMS field triage criteria capture severely injured patients but also capture many people with minor injury who do not need air transport to a Level I trauma center.
- Both hospitals have the resources to provide definitive care, and MRMC is committed to providing rapid trauma response and evaluation so that, when necessary, patients can be transferred to a higher level of care.

PATIENTS TRANSPORTED BY EMS TO NON-TRAUMA HOSPITALS

A small number of injured patients were transported by EMS to a non-trauma hospital in SBC. (See the beginning of Section III for specification of what patients were included in the data.) The table below shows those transports for 2022 through the 1st quarter of 2023, as well as the number of patients transferred from those hospitals to the trauma centers.

NON-TRAUMA HOSPITAL PATIENTS			
	Goleta Valley Cottage Hospital	Lompoc Valley Medical Center	Santa Ynez Cottage Hospital
American Medical Response	37	36	54
Santa Barbara County Fire	2	32	3
Total EMS from Field	39	68	57
Transfers to SBCH	118	58	64
Transfers to MRMC	0	6	1

IV. CURRENT FIELD TRIAGE PRACTICES

EMS FIELD TRIAGE

One of the most challenging components of trauma is identifying patients in the field with life-threatening injuries and the need for emergent intervention. The Centers for Disease Control and Prevention (CDC) has provided guidelines (most recently in 2011) to assist EMS agencies set criteria for providers in the field to help determine if the patient should be transported to a trauma center. These CDC criteria were grouped into stepped criteria: **Step One** included physiologic criteria, **Step Two** included anatomic criteria, **Step Three** included mechanism of injury criteria, and **Step Four** included special considerations for geriatric, pediatric, or pregnant patients.

In 2020-2021, the ACS convened a panel of national experts to update and pilot the guidelines. The new guidelines now have two main categories:

- **Red Box** of high-risk criteria (previously Step 1 physiologic criteria and Step 2 anatomic criteria)
- **Yellow Box** of moderate-risk criteria (previously Step 3 mechanism criteria and Step 4 special considerations criteria)

Other substantive changes were made to triage criteria, and SBC EMS is actively working with its trauma centers and EMS providers to determine which changes should be reflected in triage practice. Those changes will be made independent of recommendations specified in this report.

The new transport recommendations state that patients meeting high risk criteria (RED) “should be preferentially transported to the highest-level trauma center available within the geographic constraints of the regional trauma system.” When SBC EMS submitted a letter to the ACS for help defining “highest-level trauma center,” the reply was that the definition should be specific to the region and account for geography, EMS capacity, and trauma center capabilities.

The revised guidelines are also silent on when air EMS should be utilized. Per the 2022 standards: “Current evidence is insufficient to make specific recommendations regarding transport times and when air medical services should be activated.”

TRAUMA TRIAGE

Trauma triage refers to the transport of an injured patient from the scene of injury to definitive care at an appropriate trauma center. In LEMSAs with at least one Level I trauma center and one Level II trauma center, definitive care is available at both Level I and Level II centers. In other words, both levels provide the highest level of care and can receive, evaluate, and stabilize severely injured trauma patients.

We can find no examples from within California or around the country where EMS triage policy differentiates Level I trauma centers from Level II trauma centers in setting EMS triage decisions. A document from Santa Clara specifies EMS triage as follows: “By system design, trauma patients with major injuries are transported from the field directly to the trauma center that affords them the shortest time to definitive care.”

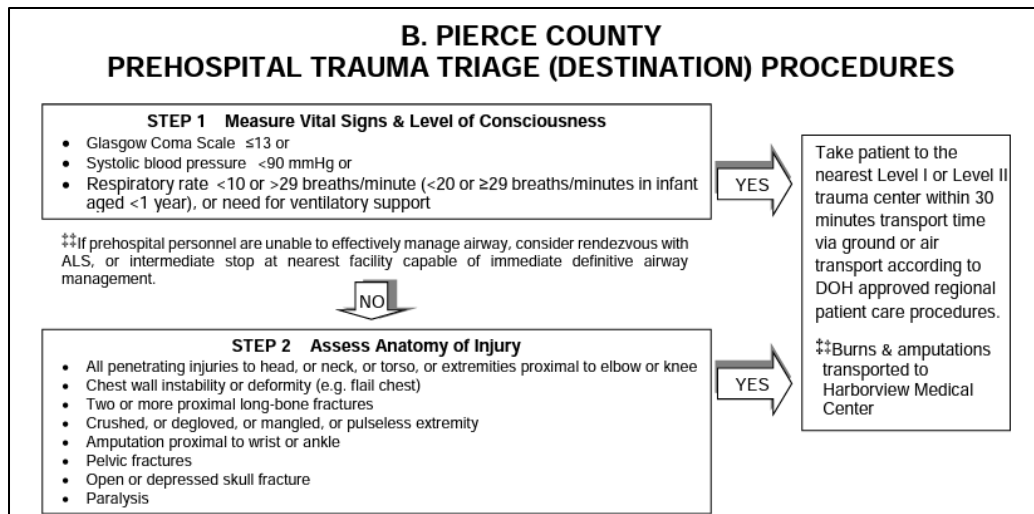
The following six California LEMSAs were reviewed because they included at least one Level I and one Level II trauma center:

California LEMSA	LEMSA Has Level I and II Centers	Distance to Next Closest Traum Center	Policy Differentiates Level I and Level II TCs
Sacramento County	Yes	6 miles	No
Inland Counties	Yes	7 miles	No
Santa Clara County	Yes	8 miles	No
Alameda County	Yes	13 miles	No
Orange County	Yes	23 miles	No
Riverside County	Yes	43 miles	No

We are also unable to identify any EMS policy from outside of California that differentiates the two levels in EMS transport destination, although there are many differences accounted for by state and region, including urban/rural, geography, weather, and state- or ACS-verification of trauma centers. A few examples from the western US are noted below.

- In Oregon, state law prescribes transport to the highest level of care within the trauma system, with no differentiation for Level I or Level II trauma centers. The law explicitly lists specific categories of major trauma, including penetrating injuries, spinal cord injuries, traumatic brain injury, and high-grade organ injuries, and does not dictate that patients with these injuries must be transported to a Level I trauma center (OAR Chapter 333, Division 200, Exhibit 5). Oregon has a single Level I trauma center in Portland.
- In the state of Washington, all trauma centers are state-verified rather than ACS-verified. EMS policy for Pierce County (Tacoma) explicitly specifies two injuries that should be transported to Harborview Medical Center, the Level I trauma center in Seattle (38 miles north of the Level II trauma centers in Tacoma): burns and amputations.

Notably, Harborview is the only verified burn center in Washington. Capability for replantation is now a Level I and Level II trauma center requirement in the new ACS standards (4.25) but trauma centers are allowed to transfer select patients to replant centers in the National Hand Trauma Center Network (neither SBCH nor MRMC is in this network).



TRAUMA TRANSFER

After patients have been triaged to the trauma center, some patients will require transfer to a higher level of care for specialized resources. It is incumbent upon all levels of trauma centers to have specific criteria and policies that allow for quick determination of patients who need a higher level of care and an efficient plan to expeditiously arrange and initiate transfer. Given the distance between the two trauma centers and other trauma centers in the broader region, patients in SBC are nearly always transferred between hospitals by air to minimize transport time.

AIR EMS

Air EMS is an essential and important resource in the trauma system, and the main provider (CALSTAR) transports trauma patients to both MRMC and SBCH. CALSTAR leadership reported positive and collaborative relationships with both hospitals.

PATIENT PREFERENCE

One consideration for transport destination is patient preference, which can be based on several factors: proximity to home and family, in-network access to past medical records and follow-up services, or prior experience with a physician or service at one hospital. While EMS should prioritize clinical assessment, distance to trauma center, and EMS triage criteria when determining trauma center destination, it is also known that patient preference does impact triage decisions for patients with less severe injury or when distance to two trauma centers is equivalent (Newgaard et al. 2011). In a retrospective study of hospitals in the western United States, patient or family choice was cited as the most common reason for EMS providers selecting a destination hospital, even after controlling for field triage protocols (Newgaard et al. 2013).

Findings demonstrate the importance of patient choice in EMS transport decisions, particularly when other factors (such as distance to trauma centers) are equal.

In the Central Valley region of SBC, injury locations are approximately equidistant to both trauma centers. Because Santa Ynez Valley Cottage Hospital in Solvang is part of the Cottage Health System, there is potential for patient and family preference to SBCH to be a factor of trauma center destination for patients who live in the Central Valley.

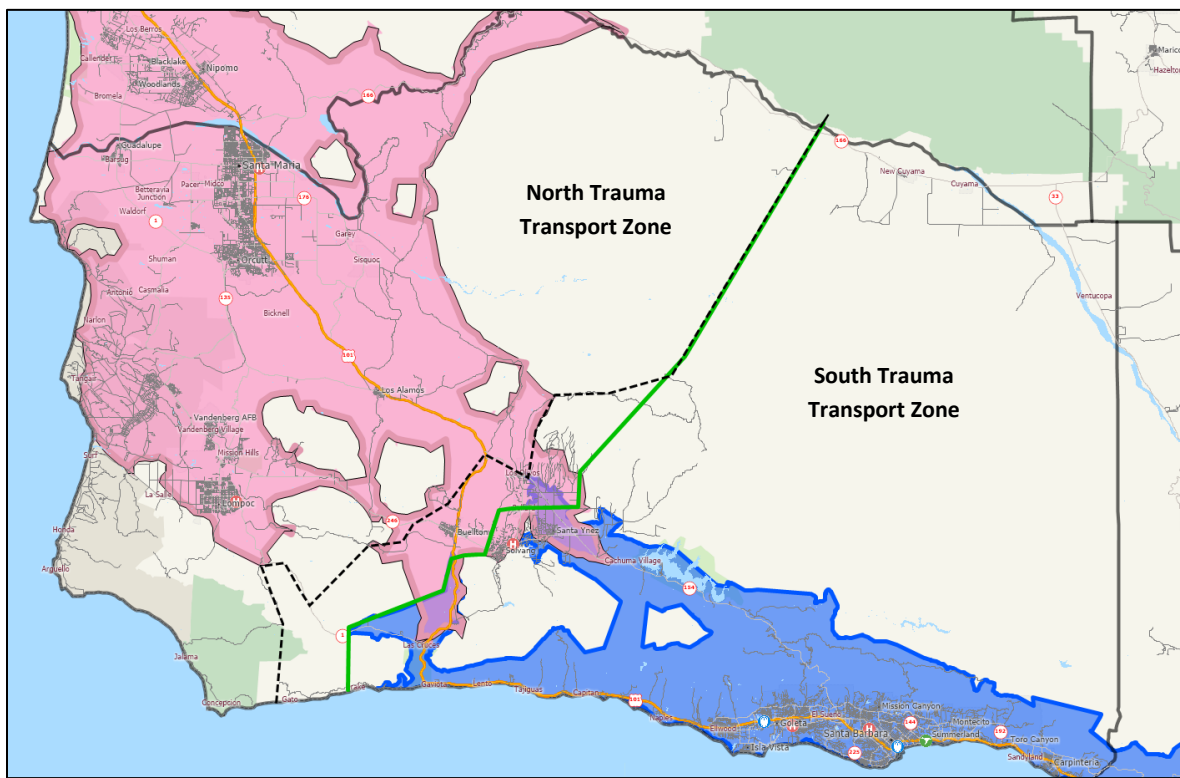
V. CONCLUSIONS & RECOMMENDATIONS

The two trauma centers have both been verified by the ACS. While the current EMS triage procedures were suitable for the trauma system when MRMCM was a Level III trauma center, the procedures do not reflect current practice in other California LEMSAs or other regions of the country. **SBCH and MRMCM are both capable of providing definitive care for injured patients. Definitive care includes the ability of a hospital to admit, treat and discharge, or stabilize and transfer, a trauma patient.**

After reviewing data and reports from both hospitals and engaging in several collaborative conversations with key stakeholders, B+A has the following conclusions and recommendations.

IMPLEMENT A LEVEL I – LEVEL II ADULT TRAUMA SYSTEM

The county should be divided into equal halves based on transportation and geographic parameters and EMS should be empowered to take adult patients (ages 15 years and older) to the closest trauma center. The suggested division is shown in green on the map below, with boundaries following major roads to aid EMS in the field, but final boundaries should be established collaboratively by county EMS stakeholders. The current EMS North/South Transport Zones are delineated by a black dotted line.



DEFINE A PEDIATRIC TRAUMA SERVICE AREA

Given that the two trauma centers have differing resources for pediatric trauma patients, it is recommended that a pediatric trauma service area is created. If the scene of injury is within 20 driving minutes of MRMC, the pediatric patient should be transported by ground EMS to MRMC. If the scene of injury is within driving distance of SBCH or the patient is injured in an area that requires air transport, the pediatric patient should be transported to SBCH.

The policy should mitigate the chance of a pediatric patient being flown twice; the helicopter should be used to transport the patient to definitive pediatric care. We suggest the county utilizes the ACS definition of a pediatric trauma patient (age less than 15 years) and works collaboratively to define the best care for 15-17 year old patients.



It is noted that SBCH had approximately 60 pediatric trauma admissions in 2022. It is possible that the additional pediatric neurosurgery coverage will increase pediatric trauma admissions. If SBCH reaches more than 100 annual patients and can meet the ACS standards for a Level II pediatric trauma center, SBCH should be encouraged to pursue such verification as a resource to the trauma system.

The trauma centers and EMS should work collaboratively on triage decisions following events where multiple family members are injured (including pediatrics and adults). Efforts should be made to keep families together, but trauma center destination should be driven by the needs of the most severely injured patients. If a pediatric patient is the most severely injured patient, EMS could consider transporting the family to SBCH.

MODERATE USE OF AIR EMS

Air EMS is an essential resource to a trauma system and CALSTAR reports positive working relationships with both trauma centers. Revised EMS triage policy will result in reduced

helicopter utilization, and ongoing efforts should evaluate appropriate use of air EMS resources. The trauma centers should continue to work closely with ground EMS agencies to provide transport when air transport is grounded by weather. Patient need for two helicopter transports (initial transport to trauma center and second transport to higher level of care) should be rare.

REAFFIRM PATIENT CHOICE

When possible, patient preference should be considered when transporting patients from the Central Valley. This is particularly the case if the patient currently receives care in the Cottage Health System. Transport to SBCH should be considered to ensure access to historical medical records and proximity to follow-up care.

COLLABORATION

Trauma is, by nature, a collaborative discipline, requiring the trauma centers, the LEMSA, and EMS agencies to work together as a system to achieve the best possible outcomes for injured patients. There is a need for increased collaboration between the hospitals and within the regional trauma system in four primary areas:

1. **Transfers (Including Pediatrics).** Hospitals can establish transfer agreements and relationships with trauma centers of their choosing, but it is in the best interest of patients and their families to receive definitive care as close to home as possible. Moving forward, both trauma centers are committed to optimizing both parts of the transfer process, for both adult and pediatric patients. For MRMC, this includes rapid recognition of patients requiring a higher level of care and initiation of contact with SBCH when transfer is needed. For SBCH, this includes targeted efforts to minimize delays in acceptance of transfers and work with MRMC to provide feedback and updates on patient outcomes after transfer.
2. **Injury Prevention and Disaster Planning.** As the Level I trauma center and leader of the trauma system, SBCH is committed to helping MRMC enhance injury prevention offerings in the north by contributing training, equipment, and resources in support of MRMC. The TPMs at both hospitals, along with their injury prevention specialists, should identify opportunities to increase and expand collaboration specifically for children (e.g. car seat installation checks, crib safety, bike helmets) and the elderly (e.g. Matter of Balance and fall prevention activities, safe home assessments).

In the past, SBC EMS had grant money to provide enhanced injury prevention efforts, including home assessments for people identified by EMS and Fire for referral following life assists or falls in the home. Expansion of this program or partnership with other community agencies (such as Senior Safe at Home) should be considered.

The trauma centers should also continue to collaborate on disaster and mass casualty incidents planning to ensure preparedness for events that could overwhelm a trauma center or the trauma system. Trauma centers are required to participate in and provide leadership for hospital regional disaster planning.

3. **Performance Improvement.** As a trauma system, SBC EMS should continue to facilitate collaboration in data sharing and performance improvement initiatives. EMS leadership should continue to focus on monitoring key metrics of the transfer process, including time to transfer decision (MRMC) and time to transfer acceptance (SBCH), and work with both hospitals to identify barriers to this process.
4. **Education.** The trauma centers should individually and collectively provide ongoing trauma education for EMS personnel and non-trauma hospital providers to ensure understanding of triage criteria and to provide loop closure and opportunities for improvement on difficult patient cases. This can include case study review with specific EMS agencies, as well as formal EMS provider education.

SUMMARY OF RECOMMENDATIONS

1. Adult trauma patients should be transported by EMS to the closest trauma center.
2. Pediatric trauma patients (age < 15 years) should be transported to MRMC if they are injured within 20 driving minutes of the trauma center. At distances greater than 20 minutes or in instances that require air transport, pediatric patients should be triaged to SBCH.
3. Decrease use of air EMS to reduce unnecessary transport. Air EMS should be utilized to triage patients injured in remote locations and to transfer critically injured patients to higher levels of care.
4. Patient preference should be considered in the triage decision process as much as possible.
5. Increase collaboration within the trauma system, especially for patient transfers, injury prevention and disaster planning, performance improvement, and education.

PROJECTED VOLUME CHANGES

While the above recommendations regarding adult and pediatric EMS triage will be a shift from current practice, it is expected that these changes will not have a dramatic influence on patient volumes at either trauma center. SBCH will see a reduction in pediatric patients transported from the scene of injury in the North, but this will be offset by the ability to accept more pediatric transfers from MRMC and other hospitals in the region. Proposed revisions will ensure that the

pediatric patients transported or transferred to SBCH truly need the resources of a pediatric trauma center.

B+A projects a shift of 50-70 admitted adult trauma patients per year who were formerly transported to SBCH but could now receive all their trauma care at MRMC. This will provide a 7-10% increase in trauma admissions at MRMC and a 3-5% reduction in trauma admissions at SBCH. At this time, it is not anticipated that this shift in EMS triage practices will affect SBCH's ability to maintain the minimum volumes for a Level I trauma center (1200 annual admissions).

ACRONYMS

ACS	American College of Surgeons
B+A	Bishop+Associates
CDC	Centers for Disease Control and Prevention
CT	Computed tomography
ED	Emergency Department
EMS	Emergency Medical Service
GCS	Glasgow Coma Scale
ICU	Intensive Care Unit
ISS	Injury Severity Score
LEMSA	Local Emergency Medical Services Agency
LOS	Length of stay
MRMC	Marian Regional Medical Center
OR	Operating Room
PRQ	Pre-review Questionnaires
SBC	Santa Barbara County
SBCH	Santa Barbara Cottage Hospital
TBI	Traumatic Brain Injury
TMD	Trauma Medical Director
TQIP	Trauma Quality Improvement Program

APPENDIX A: SELECT RESEARCH CITATIONS REGARDING SURVIVAL BENEFIT AT LEVEL I TRAUMA CENTERS

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APPENDIX B: SELECT “HIGHEST LEVEL OF CARE” RESEARCH CITATIONS

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Nick Clay EMS Agency Director
Daniel Shepherd, MD EMS Agency Medical Director

MEMORANDUM

Memo #: 23-0914

DATE: 09/14/2023

TO: All Pre-Hospital Personnel

FROM: Daniel Shepherd, EMS Agency Medical Director

RE: Trauma Destination

Effective September 19, 2023 at 0700, the following changes to *SBCEMSA Policy 510 Trauma Triage Criteria and Patient Destination* and Base Hospital Contact (BHC) processes will take place:

❖ Adult Trauma Patients (> 14 years of age) via Ground Transport

- Adult Step 1, 2, and 3 Trauma Patients in the North Zone, per Policy 511, will be transported to, and establish BHC with, Marian Regional Medical Center (MRMC)
- All Adult Step 1, 2, and 3 trauma patients in the South Zone, per Policy 511, will be transported to, and establish BHC with, Santa Barbara Cottage Hospital (SBCH).
- Step 4 Adult Trauma Patients: Contact catchment base hospital per *SBCEMSA Policy 622 Base Hospital Service Areas and Ground Ambulance Transport Zones*.

✚ Adult Air Transport in North or South Zones

- Transporting Air Provider will determine the trauma center destination based on the fastest scene-to-door transport time. BHC must be established with the receiving trauma center.

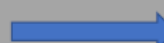
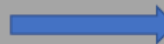
❖ Pediatric Trauma Patients (≤ 14 years of age)

- Pediatric Step 1, 2, and 3 trauma patients in the North Zone, per Policy 511, will use the following transport guidelines:
 - Drive time estimated ≤ 20 min: Transport to, and establish BHC with, MRMC
 - Drive time estimated > 20 min: Transport to, and establish BHC with, SBCH (if Air Resource is available).
 - If air resource is unavailable, transport to, and establish BHC with, MRMC.
- Pediatric Step 1, 2, and 3 trauma patients in the South Zone, per Policy 511, will be transported to, and establish BHC with, Santa Barbara Cottage Hospital (SBCH),
- Step 4 Pediatric Trauma Patients: Contact catchment base hospital per *SBCEMSA Policy 622 Base Hospital Service Areas and Ground Ambulance Transport Zones*.

❖ Chart Attached on second page with the guidelines above.

Daniel Shepherd, MD
EMS Agency Medical Director

Trauma Destination Chart – Summary of Changes

SCENE LOCATION	PATIENT AGE	TRANSPORT METHOD		STEP			
				1	2	3	4
North Zone	Adult (Greater than 14 years old)		Ground	Marian Regional Medical Center			Transport to Catchment Base Hospital per Policy 622
			Air	*Air resource determines destination based on fastest scene to destination time.			
	Pediatric (Less than or equal to 14 years old)	Drive time estimated ≤ 20 min OR Air Unavail. Drive time estimated > 20 min	Ground	Marian Regional Medical Center			
			Air	Santa Barbara Cottage Hospital			
South Zone	Adult (Greater than 14 years old)		Ground	Santa Barbara Cottage Hospital			
			Air	*Air resource determines destination based on fastest scene to destination time.			
	Pediatric (Less than or equal to 14 years old))		Ground	Santa Barbara Cottage Hospital			
			Air	Santa Barbara Cottage Hospital			