

INTRODUCTION

The San Francisco Health Commission approved the City and County of San Francisco Trauma Care System Plan in August 2001 and requested that SFGH conduct a needs assessment and feasibility analysis for a medical helipad at San Francisco General Hospital (Resolution No. 14-01). The Trauma Care System Plan revealed vulnerabilities in San Francisco's ability to prevent death and disability due to injury. The trauma system vulnerabilities – geographic isolation, traffic congestion, population density - are especially aggravated by the lack of air medical access to San Francisco's only Trauma Center. This can be particularly problematic, when injuries are sustained by young children, requiring immediate transfer to Oakland Children's Pediatric Trauma Center

In September 2002, the San Francisco Health Commission approved an agreement with the San Francisco architectural firm of Gerson/Overstreet to provide analytical, planning and architectural services for the San Francisco General Hospital Air Medical Access Needs and Feasibility Study. The final work products of the contract are: (1) a written report to the San Francisco Health Commission and Executive Administrator of San Francisco General Hospital documenting the study findings, and (2) a presentation to a regularly scheduled meeting of the San Francisco Health Commission.

There were two parts to the study effort. Part I consisted of an assessment of the need for air medical access to the San Francisco General Hospital Medical Center. In this study phase the Gerson/Overstreet project team developed information that documents the need, addresses standards of care, and describes the benefits of air medical access.

Part II was an analysis of the feasibility of establishing a medical helipad on the main campus at SFGH. In this phase of the study Gerson/Overstreet identified and evaluated five potential helipad sites on the main hospital campus. The team worked with SFGH staff and consultants to assess the structural suitability of the main hospital building to support a rooftop helipad and evaluated elevator access to the hospital's roof. Site development concept plans and cost estimates were prepared for the two highest rated potential helipad locations (the rooftops of main hospital wings A and C). This part of the project included a community outreach program where members of the hospital staff and consultant team met with neighborhood, civic and healthcare provider organizations to brief them on the nature of the study and to elicit their comments and concerns.

The principal findings and conclusions of Gerson/Overstreet's report, entitled "*San Francisco General Hospital Air Medical Access Needs and Feasibility Study*," are summarized below.

NEEDS

The study concluded that SFGH should pursue the possibility of building a medical helipad at its main hospital campus, primarily to mitigate the Trauma System Plan vulnerabilities. Additionally the study highlights the need to ensure consistent availability of standard trauma care for San Francisco and to sustain the hospital's nationally renowned Trauma Program.

As a designated Level I Trauma Center, SFGH is expected to see at least 1,200 seriously injured patients annually. The American College of Surgeons (ACS) and Title XXII (California Code of Regulations, Chapter 7 Trauma Care Systems) both require that a Level I Trauma Center meet this minimum annual patient admission volume. This volume is necessary to maintain a high level of trauma care skill and expertise for all surgeons and members of the trauma team. It is also desirable because high volume centers provide better care than low volume centers. Finally there must also be a sufficient specialty cases to attract and maintain medical experts at a Trauma Center. The annual admissions volume at the SFGH Trauma Center is declining and there is concern that without some expansion, the numbers may fall to a level where skills cannot be maintained and where the American College of Surgeons (ACS) will decide it falls below the standards required for a Level I Trauma Center.

As the standards have become more stringent (requiring 24/7 in-house coverage by trauma surgeons, anesthesiologists, operating room staff, specialized radiology technicians) the cost of being a trauma center has increased. Given the effectiveness and intensity of services required to provide Level I Trauma Center care, it is reasonable to provide services to all who could benefit from them.

Lastly, drawing principally on the work of other groups (e.g., the SF Medical Air Access Project (MAAP), the SF Emergency Medical Services Section public safety helipad permitting effort, the SF Police Department, and others), the study determined there is no easily identifiable and fully satisfactory air medical landing site in San Francisco. While the current public safety site in the Bayview Hunters Point Naval Shipyard is used to transport medical patients for tertiary care referrals, it is considered inadequate for the transport of trauma patients. This site or any other site not immediately adjacent to the Trauma Center would not meet the current standard of care for transporting seriously injured patients

BENEFITS

The San Francisco General Hospital Medical Center is a unique, 130-year old institution. It is the only Trauma Center serving the City and County of San Francisco. While the San Francisco City General Fund provides 19 percent of its annual \$403 million dollar budget, the medical center brings together an enviable number of resources. It is a primary teaching center for the University of California, San Francisco (UCSF). Attending physicians are faculty of the UCSF Medical School. Additionally the campus houses a medical library, many research facilities, a statewide Poison Control Center, an Injury Prevention Center (one of only 15 Center for Disease Control (CDC) funded

centers in the nation) and a nationally recognized Trauma Foundation. This rich aggregation of medical talent and expertise means that the medical center and its patients benefit from much more than just the resources operated and funded by the City and County of San Francisco.

There are at least three levels of benefits associated with having a medical helipad at SFGH. These benefits are summarized as follows:

Primary Benefit: Mitigation of Trauma System Vulnerabilities

A helipad at SFGH would ensure that all San Franciscans have consistent access to rapid life-saving trauma care at all times. While the primary benefit of a helipad may appear small, when measured in absolute numbers of lives saved per year, the rapid access to regional trauma centers from SFGH would prevent the potentially catastrophic impact of injury to unfortunate residents who need care when the City's Trauma Center, for unforeseen reasons, may be unavailable. The primary benefit of a helipad at San Francisco General Hospital would be the mitigation of the Trauma Care System vulnerabilities that include:

- a system with only one trauma center (SFGH)
- lack of a pediatric trauma center
- significant urban density, traffic congestion, preventing rapid transport of trauma patients by ground from SFGH to other regional adult and pediatric trauma centers, and
- a geographic area surrounded on three sides by water with recreational areas in the Bay and difficult to access coastal recreation sites Golden Gate National Recreation Area (GGNRA).

The Care of Injured Children

This primary benefit would be realized in small annual numbers, with the transport of critically injured infants, toddlers, and young children from SFGH to a Pediatric Trauma Center. There is an overall trend toward better outcomes for children treated at Pediatric Trauma Centers compared with those treated at Adult Trauma Centers.

Standard Trauma Care—Consistently

A helipad at SFGH would ensure that anyone who needs the high standard of trauma care would have access to SFGH, or to any other regional trauma center, if SFGH could not provide it. Various scenarios are conceivable and may be related to a facility problem at SFGH (i.e., power failure or massive equipment failure), a natural disaster (i.e., powerful storm, earthquake) or a multi-casualty incident with a large number of casualties requiring trauma care (i.e., explosions, fires, structural collapse).

Multiple Casualty Incidents

Rare occurrences, such as a shooting in a school, an explosion in a building, or a plane crash at the airport would immediately overwhelm the capacity of the SFGH Trauma Center to manage patients and provide standard trauma care. Some patients from incidents like these can be transported from the scene to regional trauma centers with

helipads. If SFGH had a helipad, the Trauma Center would be rapidly accessible to patients from more remote areas, such as the airport. SFGH may also serve as a secondary triage site in these events. It is likely that during such an event, more critically injured patients would arrive at SFGH than could be cared for simultaneously. The only means to ensure that these individuals would receive the standard trauma care they deserve would be to fly them by helicopter from SFGH to another regional trauma center.

Secondary Benefit—Financial Support and Maintaining Quality at the Trauma Center

A secondary benefit, after helipad construction, would be the financial and patient volume support for the Trauma Center generated by increasing numbers of tertiary referrals. Air medical access to SFGH will aid the economic viability of the Trauma Center.

Economic Benefit of Air Medical Access

With a limited City government budget, new sources of Trauma Center revenue must be generated to offset fiscal constraints and provide the capital required to keep abreast of advances in healthcare technology. SFGH has successfully expanded its trauma services to northern San Mateo County that benefits from Level I Trauma Center care, and that contribute to a beneficial payer mix at the hospital. However, 30 percent of San Mateo patients transported by ambulance to SFGH from San Mateo County are San Francisco residents. Air medical transport patients from the broader suburban and rural regions of Northern California are likely to compare with this payer mix.

Patient Volume and Trauma Center Performance

The Trauma Center at SFGH has had a steadily declining annual patient volume over the past decade. With immediate access from a helipad to its Trauma Center, SFGH would benefit from the broader referral base in the Bay Area and Northern California region. The ability to provide outreach to suburban and rural communities with no Trauma Center, or with Level II, III and IV Trauma Centers, will facilitate a more efficient exchange of the research knowledge and trauma care education for which SFGH is renowned. Additionally, such outreach will address the ACS requirement that a Level I Trauma Center serve as a resource and referral center for the broader region, while supporting the annual patient volume the Trauma Center needs to maintain and enhance the skills of trauma care clinicians.

Medical Staff Recruitment and Retention

The continued success of SFGH is also related to its ability to recruit and retain top academic faculty for its clinical and research programs. Air access to SFGH will support the specialty patient referral volume the institution needs to continue to attract qualified medical specialists and to maintain a technologically advanced tertiary care facility.

Tertiary Benefits—San Franciscans Injured in San Francisco and Northern California

Because of its dense urban setting, helicopters normally do not respond to the scene of accidents on a daily basis in San Francisco, with the exception of offshore, island, water, and bridge rescues. An estimated 25 trauma patients bypass SFGH annually via helicopter and are flown to Trauma Centers in Contra Costa, Alameda and Santa Clara Counties. In 2002, 5 out of 8 severely injured people from the Presidio and Marin Headlands were San Francisco residents who were flown away from San Francisco to neighboring Trauma Centers. Every year roughly 600 San Francisco residents are hospitalized for injuries outside of San Francisco. If San Francisco General Hospital had a helipad, a number of these patients could be stabilized and transferred back to their own city of residence for continued treatment at their City's renowned Trauma Center.

Additional Benefit to the Bay Area Region

Just as San Francisco is vulnerable to disaster and multiple casualty incidents, other Bay Area towns and cities face similar threats. Air access to San Francisco's Level I Trauma Center would allow SFGH to fully participate in regional medical mutual aid for its neighboring communities, and a rapid transport option for individual patients who need the Level I care that SFGH can provide.

Benefits Conclusions

The benefits of a helipad at San Francisco General Hospital can be measured using several scales—one of which is the number of lives saved. The decentralized Bay Area Trauma Care/ Helicopter Emergency Medical System has developed since the mid-1980's and annually saves hundreds of lives that without air access would be lost. Adding the SFGH air catchment region to the Bay Area trauma system would save five to ten minutes flight time for patients now flown away from SFGH to regional centers. A helipad at SFGH could conceivably save several dozen lives in the immediate catchment area on an annual basis.

Another measure of benefit is the standard of care. Without air medical access, San Francisco falls below the national trauma care systems standards for ensuring consistent rapid access to specialty injury treatment centers. On a daily basis, this does not translate to a significant number of preventable deaths or pronounced disability. Yet, San Franciscans do not have assurance that death and disability will be prevented, if their only Trauma Center cannot provide care when the facility is overwhelmed or incapacitated. Therefore,

...the primary benefit of a helipad at SFGH is this contingency assurance of access to life-saving care for the few or many, who may need it in a variety of unusual, but increasingly likely, incidents.

A third measure of benefit is sustained value. The Trauma Center in San Francisco has proven its value for its residents and visitors for over thirty years. A helipad at SFGH offers the ability to provide regional outreach and referral, and to attract the volume that supports the capital investments in technology required to sustain a Level I Trauma Center, as well as generates needed revenue that helps sustain the entire medical center.

FEASIBILITY

Four locations on the main hospital campus were identified as possible helicopter landing sites. A fifth location was identified on the hospital parking structure south of 23rd Street. The objectives for locating the helipad on the SFGH campus were as follow:

- Be located as close as possible to the emergency department, operating room, and intensive care to minimize travel distance, patient transfers and unnecessary patient handling;
- Be located on a site where the helipad can be secured and the arrival/ departure (flight) paths are not compromised in the future by maturing trees, new development, utility wires, or vehicle traffic; and
- Be located on a site that would have as little noise impact on the surrounding community, as possible.

Four of the sites were on rooftops and one was on the ground in the street-level parking lot near the hospital emergency department entrance. Of the main hospital rooftop sites that were evaluated, only two (Wings A and C) were deemed appropriate locations for a helipad. Wing C is ranked first and would provide the best location for patient transfers to the Emergency Department, Operating Room, and Intensive Care Units, while diminishing noise to the surrounding neighborhoods.

Structural and Elevator Requirements

The structural engineering firm of Degenkolb Engineers was tasked with determining if there were any significant structural requirements that would substantially affect the cost of design and construction of a new helipad on the roof of the existing main hospital building at San Francisco General Hospital. Degenkolb concluded that the additional weight of the helipad would not increase the seismic forces in the top story by more than 5 percent. Therefore, the addition would not invoke a regulatory requirement to strengthen the building for seismic forces.

The Otis Elevator Company reviewed the existing elevator hoist way plans with respect to providing two elevators for roof top helipad access. Otis determined that the elevators were installed in 1972 and have remained largely unchanged since their installation 31 years ago. The elevators were found to be in average condition, with several components at the end of their useful life. Any project that reconfigures the existing

elevators may have significant cost associated with upgrades of the elevator subsystems.

Estimated Project Cost and Timeline

The total cost to develop a rooftop helipad at SFGH was estimated to be on the order of \$3 million, including planning, permitting, and design (\$825,000), and construction (\$2,175,000). The estimated time necessary to plan and build the project, including environmental review and permitting, is estimated to be approximately two years.

Helicopter Safety

The study found that air medical helicopter operations are not inherently unsafe, but accidents can and do happen. Secondly, should an accident occur, the greatest danger would be to the aircrew members. There is little evidence to support any danger to surrounding neighborhoods, even though some of these neighborhoods would be subject to helicopter overflight.

Noise

Noise was identified as being the overriding concern of hospital neighbors attending the community outreach meetings for the project. A secondary concern was the potential effects of helicopter operations at the hospital on residential property values. Charles M. Salter Associates, a San Francisco acoustical engineering firm, conducted preliminary noise analyses as part of the study. Helicopter noise contours developed by Salter indicate that under a worst-case scenario of two daytime and one nighttime flights to and from the hospital, the criterion noise level of 65dB DNL (day-night noise level) used by the FAA and CalTrans, would be confined almost entirely to the hospital campus. The study recommends that additional noise studies be carried out as part of the project environmental review process to authenticate this finding.

Community Outreach

Community outreach activities were incorporated into the goals and objectives of this Study. From October 2002 through February 2003 the Study team undertook significant outreach to neighbors and communities served by SFGH, civic organizations and San Francisco healthcare providers.

Public meetings were conducted with neighborhood groups, healthcare provider groups and civic organizations. In all, fifteen (15) meetings were held. SFGH received 57 letters from medical and EMS leaders in support of air medical access to the City of San Francisco and its Level I Trauma Center. A Helipad Feasibility Hotline was established and advertised on outreach materials.

Endorsements were received from the San Francisco Hospital Council, the San Francisco Medical Society, San Francisco Planning and Urban Research Association (SPUR), the Operations Advisory Committee of the SF EMS System, the California

State EMSA, the San Mateo EMSA, and the San Francisco chapter of the Emergency Nurses Association. The individual institutions that endorsed the project were: Chinese Hospital, St. Francis Hospital, the UCSF Medical Center, as well as Marin General Hospital, Seton Medical Center, UC Davis Medical Center, and Santa Clara Valley Medical Center.

In the medical community, in neighborhoods both closely linked to the SFGH Potrero campus and located at some distance, and within City-wide groups, there is support for a helipad as a part of San Francisco General Hospital's Level I Trauma Center. However, among immediate neighbors of the hospital, attitudes about a medical helipad at SFGH ranged from skepticism and strong opposition to support, pending additional information.

It will be necessary to identify and clarify the extent of negative impacts on neighboring residential areas as part of the environmental review process and to bring forth the findings for public review. Opportunities to mitigate these impacts will need to be identified and actively pursued to achieve positive results for everyone in San Francisco.

Conclusion

The San Francisco Trauma Care System Plan documents the considerable effort and discussion that have been devoted to the subject of helicopter utilization in San Francisco over the past 30 years. Neighborhood concern related to noise, safety, and commercial helicopter utilization have been recorded since emergency medical use of helicopters was first studied in San Francisco in 1985.

The vulnerabilities to San Francisco's emergency medical service and trauma care system are well documented. The Health Commission requested that SFGH conduct a thorough and objective evaluation of the need for and feasibility of consistently available air access at San Francisco General Hospital Medical Center. Gerson/Overstreet Architects and a team from SFGH conducted this study from September 2002 to February 2003. This report, presented to the Health Commission on March 4, 2003, documents the need for air medical access to the City and County of San Francisco and to its only Trauma Center with the conclusion that it is feasible to construct a medical helipad on the roof of SFGH.