

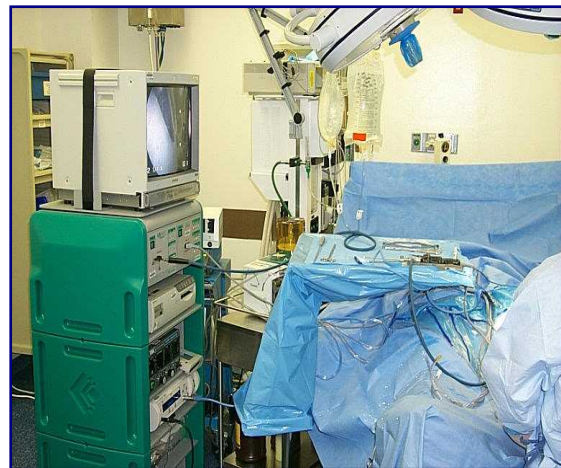
## NAVAL HOSPITAL, ROTA RESOLVES ERGONOMICS AND SAFETY ISSUES IN OPERATING ROOM

Naval Hospital (NAVHOSP), Rota, Spain serves active and retired military personnel and their family members. The main hospital facility has a 26-bed capacity, expandable to 52 beds under contingency situations. The hospital also maintains a group of out-patient clinics, three operating theaters, and comprehensive laboratory capabilities to serve the 3,000 Navy personnel stationed in the area and any deployed service members who routinely pass through the station's port and airfield.



Aerial view Naval Hospital Rota

When the Navy's Bureau of Medicine & Surgery (BUMED) Headquarters safety office invited all their medical treatment facilities to examine common safety and [ergonomics](#) concerns in the healthcare work setting, NAVHOSP Rota chose to study the operating room (OR) environment. Specifically, Rota's proposal was to address several safety and ergonomics challenges present in one of their ORs. Rota recommended several upgrades to the operating room configuration, including installation of the unique state-of-the-art *Skytron\** system, comprised of ceiling-mounted boom racks and flat-panel video displays located on suspended, swiveling racks.



OR was congested with equipment.

To develop NAVHOSP Rota's recommendations to BUMED, Mr David Hiipakka, the head of NAVHOSP Rota's Industrial Hygiene & Occupational Health Services, himself a certified industrial hygienist and Command Ergonomics Team member, made a careful study of the OR by observing numerous surgical procedures. Mr. Hiipakka found that typical of many operating rooms, the NAVHOSP Rota OR had become a congested workplace where staff access and mobility were restricted by many pieces of equipment used for diagnostic and surgical procedures.

During these procedures, the vast majority of surgical staff and equipment are naturally centered around the operating table and the surgeon. In the NAVHOSP Rota OR, one entire side of the OR table was almost completely blocked by equipment carts, electrical cords, medical gas lines, and other surgical gear.



Electrical and gas lines presented a tripping hazard to the OR team.

The crowded working conditions in the OR presented safety issues for the surgical team.

For example, electrical cords and gas lines

located on the operating room floor were a tripping hazard. In addition, surgeons and technicians were in the path of possible exposure to potentially harmful surgical smoke from cauterizing and burning tissue.

One of the most frequently used pieces of equipment in modern ORs is the video endoscopy system (VES) comprised of a camera, light source and video monitor used to examine patients' upper digestive tracts, perform arthroscopic knee procedures, etc.

Several ergonomics issues were related to the use of the VES camera technique in the NAVHOSP Rota OR. The VES cart blocked one side of the OR table making equipment access



Surgeons and OR staff stand for long hours and adopt awkward postures during VES procedures.

and adjustment difficult; the distance needed to reach the patient across the operating table created awkward working postures; and while using the VES camera technique, surgeons and OR staff members stood at the operating table for up to six hours (more during complicated orthopedic surgery) while maintaining an essentially immobile posture.

Working in the same position, standing for long periods, and/or maintaining awkward postures can lead to discomfort of the neck, arms, shoulders, back, knees, and legs. Standing for long periods can also cause pooling of blood in the legs and feet, resulting in aching and fatigue. Frequent, repeated, or lengthy exposures to such risk factors may not allow for adequate rest and recovery of fatigued muscles. When that happens, the worker may develop a [Work-Related Musculoskeletal Disorder](#), or WMSD.

To enhance the study of ergonomics in the NAVHOSP Rota OR, Mr. Hiipakka requested assistance from the Navy Ergonomics Program. The Navy Ergonomics Program was established to reduce the frequency and severity of WMSDs. The program introduces ergonomics principles in the redesign of work tasks, workstations, procedures, and tools that have been proven to minimize such risk factors.

An ergonomist from the Navy Ergonomics Program facilitated the administration of a Job Requirements & Physical Demands (JR/PD) survey to the OR staff and analyzed the survey results. The JR/PD is an occupational health survey that the military utilizes to identify risk and discomfort in work environments and to prioritize corrective actions. The results of the overall ergonomics assessment and JR/PD confirmed the presence of sufficient ergonomics risk factors in the NAVHOSP Rota OR to classify it as an “Ergonomics Problem Area.”

Based on observations and results of the JR/PD, NAVHOSP Rota



System of ceiling-mounted boom racks and flat-panel video displays located on suspended, swiveling racks reduces clutter in OR and allows surgical team to work in neutral postures.

recommended the purchase of ergonomically designed OR equipment. This included seating for surgical staff and *Skytron* equipment carrier racks that would eliminate awkward work postures and mitigate the effects of standing for long periods. In the process, potential safety hazards created by cable and gas line clutter and electro-surgical smoke would also be eliminated as these utilities would now be re-routed through ceiling outlets to pass through the *Skytron* system.

To make the recommended improvements to the NAVHOSP Rota OR, the command applied for funding from the Chief of Naval Operations Hazard *Abatement and Mishap Prevention Program* (HAMPP), managed by the Naval Facilities Engineering Command. HAMPP oversees and funds the correction of identified high-risk safety and health deficiencies, which exceed the funding capabilities of Navy shore activities that request such assistance. NAVHOSP Rota was funded through the HAMPP to improve the work environment of the OR. The major portion of the HAMPP funding provided for demolition of the existing OR ceiling, installation of *Skytron* ceiling mounted equipment carriers, and purchase of ergonomically designed surgical seating to field test these cutting edge technologies.

Surgical chairs have been provided for NAVHOSP Rota surgeons and surgical technicians to reduce the risk of WMSDs from standing for long periods during surgical procedures. After testing several designs, the surgical staff preference was for the chair pictured at right. This “Xomed entroll” \* chair was rated by the staff as providing the widest range of height adjustments, arm positioning, tilt, etc. for use during a variety of surgical procedures. The range of adjustments helps surgeons and technicians to avoid working in awkward postures.



The most significant change to the NAVHOSP Rota OR was the installation of the unique *Skytron* system, which allows the myriad of surgical support equipment (e.g., VES cameras, light sources, monitors, surgical smoke evacuators, etc.) to be re-located off the floor onto suspended, swiveling racks. Because equipment and wires were moved off the floor, tripping hazards in the OR have been virtually eliminated.



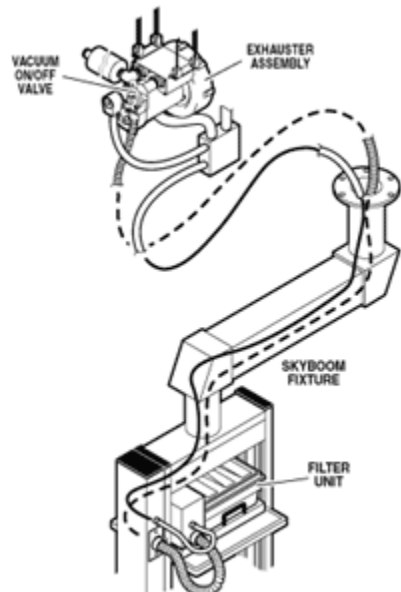
Swiveling racks and powered height adjustable system eliminate working in awkward postures.

The swiveling racks allow lighting and instruments to be moved into positions with a reach of 90 inches to key target areas via a height adjustable system featuring tethered remote hand controls for convenient up/down placement and operation of equipment per each surgeon’s individual preferences.

Thanks to the adjustable equipment shelves allowing 360 degree positioning around the entire periphery of the patient, these features eliminate the need for surgeons and staff to force and contort their bodies around OR gear. This important reduction of working in awkward postures prevents the risk of WMSDs.

The *Sky Vacuum*\* [local exhaust ventilation system](#) was also installed in the Rota’s model OR to improve Indoor Air Quality and to address the issue of possible pathogenic exposures of the OR staff to potentially harmful electro-surgical smoke. This engineering control (see diagram below) is designed to capture and remove potentially harmful laser and electro-surgical smoke particles down to the size of 0.01 microns via its ultra-fine high efficiency filters rated at 99.99994% capture capacity. A

side benefit of this filtering system is that it also eliminates odors and contamination typically generated by uncontrolled surgical plumes, while greatly improving vision at the surgical site.



*Sky Vacuum* captures and removes potentially harmful laser and electro-surgical smoke particles from breathing space of OR team.

The renovated NAVHOSP Rota OR was recently toured by a delegation from the prestigious “Virgen del Rocio” (VDR) University hospital of Seville, Spain. This team’s objective was to gather ideas for their hospital’s 60 million Euro (\$80 million) renovation with the goal of designing one of the most modern medical facilities in Spain -- and for that matter throughout Europe.

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