

done to determine interrater reliability. The interrater agreement for this sample of charts was determined using kappa statistics. Descriptive statistics (mean, SD) and frequency tables were used to describe the key quantitative and qualitative variables.

During the study period, 563 RCRs were submitted to the IRB; 172 studies were excluded from analysis because they were categorized as non-human subjects research (NHSR) (74%), withdrawn by investigator (21%), or evaluated primarily by another IRB (5%). A total of 391 protocols used a retrospective study design and were included in our analysis. This represented 28.4% of all the eligible protocols submitted during the study period. These retrospective protocols represented 28 medical specialties, including cardiovascular (15%), pediatrics (12%), pharmacy (12%), general surgery (10%), neurosciences (9%) and emergency medicine (7%). Faculty physicians were generally the principal investigators (74%), followed by residents (14%), pharmD (8%), nursing staff (2%) and medical students (2%).

Of the 391 protocols, 43 (11%) were exempt, 348 (89%) were expedited by the IRB. Overall, 233 (59.6%) were sent back to the principal investigators for revisions prior to final approval. A total of 796 deficiencies were documented in RCRs for an average of 2.0 ± 2.7 deficiencies per protocol (Table 1). Common deficiencies included poor documentation, personnel issues, missing data elements, and inadequate description of data storage. IRB turnaround time for those studies that did not need revision (submission to approval) was 26.4 ± 15.1 calendar days. IRB turnaround time for those studies that required revision was 38.6 ± 23.6 days. There was no correlation between total number of revisions and turnaround time in days ($r = 0.188$). Interrater reliability was calculated across the 17 methodologic criteria; the consistency of the data recording was excellent, with a median kappa statistic of 0.88.

In general, investigators should plan to submit a complete application for IRB review at least one month prior to beginning an RCR. Almost 60% of protocols were not approved on the first review because of missing, incomplete or contradictory documentation, errors, or omissions in the protocol or application. IRB staff are available in most institutions answer questions about IRB requests for modifications or clarification and can offer guidance on how to revise submission materials accordingly. Suggestions to potential investigators include: eliminate partial responses to IRB questions, obtain statistical consult prior to submission, have another investigator pre-review submission, update required research training and conflict of interest questionnaires, use IRB templates when possible, and include a description of safeguards to adequately protect retrospective data from a breach of confidentiality.

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Lemierre's syndrome: A forgotten complication of acute pharyngitis



Lemierre's syndrome (LS) is a rare disease of the head and neck that is often characterized by a history of oropharyngeal infection, leading to septic thrombophlebitis of the internal jugular vein (IJV) and septic lesions in more distant organs, such as the lung [1,2]. Patients diagnosed with LS in the Emergency Department (ED) are generally healthy teenagers and young adults, who present with a history of several days of sore throat accompanied by fever before more severe symptoms begin [3]. LS is difficult to diagnose due to non-specific symptoms, and frequently minimal clinical findings in the neck and oropharynx [3]. Pleural effusions, cavitory pulmonary lesions, and venous thrombosis are common findings on pulmonary imaging [3]. This syndrome is most often a result of a *Fusobacterium necrophorum* infection. *Fusobacterium* spp. are gram negative anaerobes and are part of the normal human microflora of the oropharynx, genitourinary and gastrointestinal tracts [1]. Other pathogens that cause LS include *Streptococcus viridans*, *Bacteroides*, *Peptostreptococcus*, and *Enterococcus* spp. [2]. Prognosis for patients suffering from LS is quite good if given prompt intravenous antibiotic therapy and supportive care. The objective of this study was to assess the incidence, clinical characteristics, and microbiologic source for patients diagnosed with Lemierre's syndrome from three academic medical centers in West Michigan.

We performed a retrospective cohort study using a database of all admissions to three adult and pediatric hospitals in West Michigan during a ten-year study period. Eligible patients presented with both a history of an oropharyngeal infection and internal jugular vein thrombophlebitis with an isolated or mixed *Fusobacterium necrophorum* infection, or an infectious disease specialist diagnosed Lemierre's syndrome. Clinical records were reviewed for demographic data, presenting symptoms, initial vital signs, emergency physician evaluation, and laboratory data. Metastatic complications, hospital length of stay, and mortality were assessed as well.

During the study period, 16 patients with Lemierre's syndrome presented to one of the participating hospitals. Nine (56%) subjects were female. The majority (75%) were ≤ 24 years of age (range 12–76). The average duration of symptoms prior to hospital admission was 7 days (range 2–14). A typical presentation was a significant increase in fever (39–41 °C), often associated with rigors, approximately 5 days after the onset of a sore throat. Other clinical features included a history of fever 15 (94%), pharyngitis or tonsillitis 15 (94%), cervical adenopathy 12 (75%), lateral neck pain or swelling 11 (69%), myalgia/arthralgias 11 (69%), rigors 9 (56%), leukocytosis ($>15K$) 5 (31%), and dyspnea or cough 4 (25%). The diagnosis was generally made by a cervical or thoracic CT with contrast (50%), ultrasound (44%), or MRI (6%). The microbiologic source for these infections included *Fusobacterium* (50%), MRSA (16%), anaerobic *Streptococcus* (6%), and *Bacteroides* (6%).

All patients were given anticoagulation for septic emboli, broad spectrum IV antibiotic coverage (7–15 days), and surgery for abscess drainage (31%). Infectious complications included pulmonary (emboli, effusion) 10 (63%), elevated liver enzymes 9 (56%), liver/splenic abscesses 4 (19%), septic arthritis 3 (19%), septic shock 3 (19%), cutaneous abscess 2 (13%), and renal failure 2 (13%). All patients survived and the average length of hospitalization was 11.8 days (range 7–32).

Recent data suggest that in adolescents and young adults (persons aged 15 to 30 years), *Fusobacterium necrophorum* causes

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endemic pharyngitis at a rate similar to that of group A beta-hemolytic streptococcus, with a reported incidence of about 10% [4,7]. Therefore, in addition to group A streptococcus, *F. necrophorum* should be considered when adolescent patients present with pharyngitis. Recently, more cases of MRSA-associated Lemierre's are now being reported, which we found in our study population [5,6]. Currently, there is no rapid diagnostic test available to identify *F. necrophorum* pharyngitis [7]. When pharyngitis does not improve as expected with typical antibiotic coverage (within 3–5 days) and unilateral neck swelling develops, physicians should consider an expanded differential diagnosis for uncommon infectious sources [4]. This should include suppurative complications (peritonsillar abscess and the Lemierre syndrome), group A, C, or G streptococcal pharyngitis, infectious mononucleosis, and acute HIV infection [4]. Diagnostic imaging, including cervical and thoracic CT and/or ultrasound should be considered. If the patient has bacteremic symptoms, it has been suggested to treat either with a combination of penicillin and metronidazole, or with clindamycin alone to target *F. necrophorum* and streptococcal infections [4]. If MRSA is isolated, antimicrobial regimens must be adjusted accordingly.

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Emergency physicians and nurses can provide percutaneous cardiopulmonary support in emergency departments

To the editor,

The therapeutic benefits of extracorporeal cardiopulmonary support have been demonstrated in patients with cardiac arrest, cardiogenic shock, and pulmonary embolism [1–4]. Under most circumstances, extracorporeal cardiopulmonary support requires well-trained and fast-reacting cardiovascular surgeons and perfusionists to perform a cardiopulmonary bypass. However, it is difficult to equip a 24-h on-call team with at least a cardiovascular surgeon and a perfusionist in most health care facilities, which confines the application of extracorporeal cardiopulmonary support to emergent conditions.

Percutaneous cardiopulmonary support (PCPS) was introduced as an alternative to extracorporeal cardiopulmonary bypass and became a useful procedure because of its portability, rapid priming, and ease of handling [5]. In the emergency department of our institution, we developed a protocol with EP- and EN-operated PCPS, which consisted of education programs and ultrasound-guided placement of PCPS. We described this protocol and verified its efficiency in the emergency department.

A total of 33 EPs, 24 residents, and 114 ENs were present in the emergency department of Chi-Mei Medical Center to provide medical services. First, an experienced cardiovascular surgeon and a perfusionist were invited to our emergency department to demonstrate the cannulation and operation of PCPS. Then, we held workshops and seminars about PCPS and related videos on PCPS on social media among the group of EPs and ENs. Additionally, we debriefed all participants in the emergency department after each implementation and operation of PCPS.

From August 2016 to September 2017, the EPs conducted 7 attempts to apply PCPS (Capiox EBS, Terumo, Japan) on critical patients in the emergency department. At least 3 EPs and 3 ENs constituted a team. The EPs used ultrasound (SonoSite Edge II, Japan) to identify the positions of the common femoral artery and vein of each patient. Next, they performed a percutaneous puncture to obtain vascular access and thread a guidewire through. Another EP used ultrasound to scan the patient's femoral artery and inferior vena cava to determine the position of the guidewire (Fig. 1A). Once the position of the guidewire was confirmed, the operating EP inserted arterial or venous catheters (arterial: 15 F, venous: 18 F) (Fig. 1B). The positions of the catheters were further documented by the EP using an ultrasound after placement. At the same time, the ENs began priming and preparing the PCPS machine and recorded details of the PCPS implementation. Afterward, the arterial and venous catheters were connected to the PCPS machine, which initiated an extracorporeal circulation.

Four male and 3 female patients, aged from 16 to 75 years, underwent PCPS during the 13-month study period. The first patient was a drowned woman who had been resuscitated for 38 min and regained a detectable pulse. With the exception of the first patient, the other 6 all died from cardiovascular diseases (3 from myocardial infarction, 2 from myocarditis, and 1 from pulmonary embolism) and underwent PCPS in states of cardiac arrest. The times for cardiopulmonary resuscitation and implementation of PCPS in these patients were 56.6 ± 34.8 and 44.6 ± 14.1 min (average \pm standard deviation), respectively. After the implementation of PCPS, 4 patients required blood transfusions to restore intravascular volume and maintain adequate PCPS function. Serum lactate levels were obtained in 5 patients and the average level was 13.3 mmol/L (range: 5.9 to 22.8).

PCPS was implemented successfully in 6 patients in the emergency department, yielding an 85.7% success rate. Only 1 patient who could not be cannulated and another patient who underwent PCPS therapy died in the emergency department. An additional 2

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