

Vascular Care Delivery in COVID-19 Pandemic: Impact Use of an Office-Based Laboratory and an Ambulatory Surgery Center

Vascular Care Delivery Reduced the Risk of COVID-19 Transmission and Resource Utilization During the COVID-19 Pandemic

Abstract

Introduction:

Methods: The records of patients who underwent vascular procedures performed by our group during the 6-week period before coronavirus disease (COVID-19) restrictions were introduced (Group-Period 1) and in the first 6-week period during the COVID-19 restrictions (Group-Period 2) were reviewed. The number of procedures performed were facility type was categorized as hospital inpatient (HIP), hospital outpatient (HOP), office-based laboratory (OBL), ambulatory surgery center (ASC), and vein center (VC). The procedures were also grouped type was classified as aneurysm (AAA), carotid (CAR), peripheral arterial disease (PAD), amputation/wound care (AMP), vascular access (VA), deep vein thrombosis (DVT), or chronic venous insufficiency/reflux (CVI). The number of healthcare provider contacts per patient undergoing care procedures at in the HOP, OBL, and ASC was also collected and compared between groups the periods 1 and 2. The significance of Differences differences between groups the periods were was determined using the two-way analysis of variance ANOVA.

Results: There were no statistically significant differences between groups 1 and 2 for The procedure location or facility and procedure types did not differ significantly by period of procedure ($p > 0.05$). Patients who received ambulatory care, Patient the number of contacts with healthcare providers was significantly lower during Period 2 than during Period 1 decreased.

between groups 1 and 2 for ambulatory care. However, projecting During Period 2, the number of contacts with healthcare providers was significantly higher among those who received for patients in group 2 if they had to have ambulatory care in the HOP setting (913) compared to contacts than in among those who received care in the OBL and ASC setting (588) statistically significant ($p < 0.05$). No healthcare-associated cases of COVID-19 were reported among patients or staff member at in the OBL or ASC during Period 2 developed COVID-19 infection because of the care received at these venues.-

Conclusion: During the height of the COVID-19 pandemic, The ability to provide the provision of essential vascular care for to ambulatory patients in an ambulatory environment was enhanced by using our the OBL and ASC to limit their contact with healthcare workers, without compromising safety or adversely affecting the outcomes, efficacy, transmission of the virus to patients or staff during the height of the COVID-19 pandemic and limited their contact with healthcare workers and therefore reduced the consumption of personal protective equipment by healthcare personnel.

1. Introduction

This study aims aimed to evaluate how access to an office-based laboratory (OBL) and an ambulatory surgery center (ASC) has affected the ability of enabled a vascular surgery group to provide essential vascular care during the coronavirus disease (COVID-19) pandemic.

Institutional review board approval was waived as no patient-specific data was used in this submission. Retrospective review was conducted on the number and type of vascular

procedures performed by our vascular surgery group between 3-February 2020 and 30-April 2020. The procedures were study period was divided into two 6-week periods based on

releasing immediately before and after the release of the American College of Surgeons (ACS) guidelines, which our group adopted immediately-adopted. Group-Period 1 included-was from cases-performed-between-3 February 3 to2020-and 20 March 20, 2020, the 6-week period immediately prior-to-before the guidelines' release and adoption of the guidelines. Group-Period 2 included-was fromcases-performed-between 21-March 21 to2020-and 30-April 30, 2020, the 6-week period during-the-early-surge-of-the-pandemic-and immediately following-after the release and adoption of the guidelines during the early surge of the pandemic. Group-During Period 2, procedures were-was limited to those deemed essential to the-patient care and survival-of-the patient.

The Coronavirus Disease 2019 (COVID-19) pandemic has had a devastated-devastating effect on global health and placed an unprecedented strain on the availability of healthcare resources^[1, 2]. With guidelines from the The American College of Surgeons (ACS) guidelines recommending-recommended the cessation-suspension of all elective surgical procedures during the COVID-19 pandemic, the-The pandemic provided an unprecedented ability-of challenge to the healthcare systems to effectively care for patients while maintaining financial infrastructure-has-been-challenged-in-ways-not-previously-seen^[3]. Global-iInitiatives, such as social distancing and sheltering-in-sheltering-in-place have-been-were mandated at-during different periods to help curtail-the-very-real-possibility-of prevent the healthcare systems being-from becoming overwhelmed by COVID-19. In addition, at the peak of the pandemic, surgical tiers of case urgency have-also-been-were implemented to adequately-allocate adequate resources and personal protective equipment (PPE) according to the greatest need, while preserving patient-care-standards-of patient care^[4]. The impact-effect of these restrictions has-created-posed a significant-major^[5] challenge on vascular surgery practices to adapt, with an

unprecedented decrease in inpatient surgical case volume and a concomitant decrease in the number of procedures performed in office-based laboratory (OBL) and ambulatory surgery center (ASC) cases facilities as well ^[5].-

2. Materials and Methods

On 20 March 2020, The ACS guidelines were published by the ACS regarding recommending the curtailment of elective surgical procedures in response to the COVID-19 pandemic were published on March 20, 2020. For both groups, the The procedures were further categorized by the types of care facility in which the procedure was performed were grouped as. Categories included hospital inpatient (HIP), hospital outpatient (HOP), office-based lab (OBL), ambulatory surgery center (ASC), and vein center (VC) facilities. The Vascular cases-procedures were also grouped by type of according to the procedure type, including as abdominal aortic aneurysmal disease (AAA), carotid artery disease (CAR), peripheral arterial disease (PAD), amputation/wound care (AMP), vascular access (VA), deep vein thrombosis (DVT), and chronic venous insufficiency (CVI). In our practice, Cases-procedures performed predominantly performed in our the OBL include percutaneous peripheral angiography, interventions for lower extremity peripheral arterial disease PAD, and percutaneous interventions to maintain hemodialysis access fistulas and grafts. Procedures performed predominantly in the In our ASC, typical procedures performed by our vascular surgeons include placing chemotherapy -access ports for patients with cancer patients  creating arteriovenous fistulas and grafts for hemodialysis. All patients were screened prior to their surgery for possible COVID-19 symptoms and exposure and had their temperature measured before the start of their procedure. Patients

~~with Positive-positive~~ screening results ~~patients~~ had their procedure canceled or rescheduled pending further evaluation, according to published guidelines.

The number of healthcare worker contacts was also recorded during these periods for the different ~~service sites-facility types~~ in ~~the 2-group~~patients undergoing ambulatory care ~~during the two periods~~. These contacts included procedures ~~done-performed at in the~~ HOP, OBL, and ASC ~~facilities-sites of service~~. ~~A further comparison was made for In~~ patients ~~in-who~~ underwent procedures during the group ~~Period 2~~, in this regard. ~~The the~~ observed and expected actual points-number of contacts in Group 2 were compared ~~with the projected number of contacts for these based on the assumption that patients if all their~~ ambulatory care ~~had to be would be~~ provided in the HOP ~~rather than setting in lieu of~~ the ASC and OBL. ~~The statistical significance of Differences-differences~~ between the results for ~~Groups-Periods~~ 1 and 2 were determined using the two-way ~~analysis of variance (ANOVA)~~  ~~statistical method~~. ~~Contact tracing was performed for all Any~~ patients ~~or-and~~ providers in our practice who developed COVID-19 ~~infection~~ during the ~~study period of review-underwent contact tracing~~ to determine ~~if their-whether the~~ infection was ~~due-attributable~~ to exposure as a consequence of our patient management strategy. This retrospective review was approved by the Pima Heart and Vascular ~~research-Research~~ committee ~~Committee~~. ~~Due-Owing~~ to the retrospective ~~nature of the review-study design~~ and the lack of ~~use of~~ patient identifiers, ~~the requirement for~~ informed consent was ~~waived-not required~~.

~~In-During~~ the ~~study period-of review~~, our group performed ~~procedures in a total of~~ 724 casespatients, of which 509 procedures were performed during Period 1 and 215 were performed ~~during Period 2~~. From February 3 through March 20, group 1 comprised of 509 cases, while group 2 cases completed from March 21 through April 30 comprised of 215 cases. The overall volume of cases decreased by 58% ~~due to during Period 2~~ COVID-19 restrictions.

3. Results

The distribution of the cases by ~~type of facility type and period~~ is shown in Figure 1.  The 724 procedures performed during Period 1 Before the implementation of COVID-19 restrictions, 234 cases (46%) were performed in HIP, 66 cases (13%) were in HOP, 7 cases (1%) were in the ASC, 57 cases (11%) were in the OBL, and 145 cases (28%) were in the VC. Under COVID-19 restrictions Of the 215 procedures performed during Period 2, 130 cases (60%) were performed in HIP, 34 cases (16%) were in HOP, 9 cases (4%) were in the ASC, 40 cases (19%) were in the OBL, and 2 cases (1%) were in the VC. Two-way ANOVA shows no significant difference. The facility types did not differ significantly between the two periods groups 1 and 2 when comparing procedure sites.

Figure 2 shows the types of cases-procedures performed for during each time period appear in Figure 2. For group During Period 1, 16 cases (3%) were AAA, 15 cases (3%) were CAR, 21 cases (4%) were DVT, 84 cases (17%) were AMP, 93 cases (19%) were VA, 121 cases (24%) were PAD, and 145 cases (29%) were CVI procedures were performed. In During group Period 2, 4 cases (2%) were AAA, 10 cases (5%) were CAR, 13 cases (6%) were DVT, 48 cases (24%) were AMP, 61 cases (30%) were VA, 63 cases (31%) were PAD, and 2 (1%) cases were CVI procedures were performed. Although the number of Two-way ANOVA demonstrates no significant difference in the type of cases, though not unexpectedly, CVI procedures was lower during Period 2 than during Period 1 cases were most prominently affected by the COVID-19 restrictions as these types of procedure was cases were not considered nonessential, the overall distribution of procedure types did not differ significantly between the two periods.

Table 1 shows the types of touch points for each service site of HOP, OBL, and ASC to compare the The number of healthcare worker encounters-contacts per patient for among patients receiving ambulatory care in HOP, the OBL, or the ASC, is shown in Table I. HOP, a The patients had contact with encounters- a mean/median 1 healthcare workers in the HOP, during their stay for an outpatient procedure. For our OBL, a patient encounters 4 healthcare workers in the OBL, and during their stay for an outpatient procedure. Finally, for our ASC, a patient encounters 6 healthcare workers in the ASC during their stay for an the outpatient procedure.

Table 2 displayed the data comparing the The total number of healthcare worker contacts during Periods points for groups 1 and 2 for among patients who receiving-received their care at-in HOP, the OBL, and the ASC are shown in Table II. based on the number of ambulatory cases at each site of service for each group. A The third column in-in Table 2-II provides the projected points- shows the expected number of contacts for patients in group-Period 2-patients, assuming that the OBL and ASC were not available for care and that all the ambulatory care was provided in the HOP-setting facility. The total number of patient-provider contacts-points for the outpatient care- we provided was significantly less-lower in patients treated when that care was provided in the OBL and ASC than in those treated in the HOP if that care had to be provided in a hospital-outpatient department. No cases of COVID-19 were reported in patients treated in the provider developed COVID-19 infection due to treatment at our OBL or ASC, or in providers working in these facilities, during the study period.

4. Discussion

During the period of COVID-19 restrictions, Our-our practice expected-experienced a decrease-of 58% decrease in the volume-number of hospital-based vascular procedures performed under-

COVID-19 restrictions. The distribution between types of ~~cases-procedures being~~ performed remained relatively ~~similar-unchanged~~ between the two ~~time~~ periods, except for AAA and CVI ~~cases-procedures~~. The precipitous drop in ~~the number of~~ CVI ~~cases-procedures is was~~ expected as ~~in most cases~~ patients with ~~chronic-venous-insufficiency-CVI~~ can safely have their intervention deferred without ~~creating any significant undue~~ risk to the patient ~~in most cases~~. ~~While-Although~~ the presence of an AAA ~~confers-is associated with an~~ ~~increasing-increased~~ risk of rupture ~~with-if~~ treatment ~~is~~ delayed, the requirement for inpatient admission ~~for-even~~ ~~for~~ endovascular repair of an ~~aortic aneurysm-AAA~~ results in ~~the-high~~ utilization of limited hospital resources. These cases were deferred unless the patient was experiencing aneurysm-related symptoms, or ~~if a delay was~~ ~~considered high-risk because of the large size of their~~ aneurysm ~~was considered large enough~~ ^{that} ~~delay would be too risky [8]~~.  strategy resulted in a decrease in ~~the number of surgeries for~~ AAA cases ~~underduring the period of~~ COVID-19 restrictions.

~~While-Although~~ there were no significant differences between location ~~the or types of facility~~ and procedure types ~~did not differ significantly between for~~ the two ~~time~~ periods, ~~the proportion of procedures performed in the we did observe that~~ OBL and ASC ~~was higher during cases-~~ comprised a greater proportion of cases in the second time period ~~Period 2 than that during~~ Period 1 (23% and 12%, respectively), with such cases comprising only 12% of cases in group 1 and 23% of cases in group 2, ~~reflecting a-~~ This observation reflects the significant decrease in the volume of hospital-based procedures being performed by our practice under the statewide restrictions on elective procedures and ~~with~~ the implementation of surgical tiers pertaining to case urgency. ~~The-continued-Continued~~ access to both ASC and OBL venues during ~~these times-~~ the period of COVID-19 restrictions ~~judicious allocation of hospital resources provided-enabled~~ our group ~~the ability to continue~~ to provide essential ~~patient-vascular~~ care services ~~to ambulatory~~

patients during the COVID-19 pandemic ~~in an ambulatory setting~~, effectively minimizing contact with healthcare workers, ~~while~~ conserving hospital PPE, and reducing the utilization of hospital resources.

Our findings also highlight the differences in the minimum number of healthcare worker critical contacts points required when patients receive that patients must make when being provided vascular care in the HOP, ASC, and OBL. ~~As one can see, They reveal that hospital-based outpatient HOP~~ services require more healthcare worker contacts per patient points that a patient ~~must navigate~~, with each ~~touch-point contact~~ conferring a risk of possible COVID-19 transmission either to the patient or to ~~a the~~ healthcare worker. ~~The benefit of utilizing The use of~~ the ASC and OBL for providing outpatient services ~~is striking had a marked benefit. We found that t~~ The number of patient contacts points was significantly less for patients receiving outpatient care in the OBL and ASC than would have been the case encountered if had that care been provided in the HOP facility was only available using hospital outpatient services. A secondary and equally important benefit of providing care in the OBL and ASC during observation in the context of the COVID-19 pandemic was is that each patient contact point requires the use of PPE by the healthcare worker. Similar to the drop in contact points appreciated by the use of the OBL and ASC, it follows that there would be a proportionately significant the associated reduction in PPE ~~utilization use~~ compared with providing the same care in the HOP facility hospital outpatient venues.

Hashmi et al. ¹⁰  Viewed the quality and characteristics of surgery and interventional radiology procedures during the COVID-19 pandemic at a tertiary center in the Midwest United States  ~~ast the COVID-19 pandemic [10].~~ They investigators observed that ~~while although~~ all case volumes decreased, the degree to which extent of the decrease in surgical subspecialty

~~procedural-procedure~~ volume ~~decreased-outpaced-exceeded that of~~ the decrease of ~~in~~ interventional radiology ~~procedural-procedure~~ volume. This was attributed to the ~~fact that~~  which higher proportion of surgical procedures ~~that~~ required general anesthesia, ~~to perform and~~ thus incurring ~~the-a~~ risk of aerosol generation ~~from-during~~ intubation. ~~In-line~~ Consistent with this observation, our study ~~observed-revealed~~ an increased proportion of vascular surgery procedures being performed in the ASC or OBL ~~settingsfacilities~~, where ~~cases-procedures~~ performed for urgent and semi-urgent indications, such as critical limb ischemia or dialysis maintenance, can be performed ~~utilizing-using~~ local anesthesia or minimal sedation.

~~We believe that with the institution of~~ Implementing methodical and rigorous screening measures, ~~and while widespread immunization with the COVID-19 vaccine is implemented,~~ ~~essential care can continue to be safely provided for~~ ~~enables the provision of essential~~ vascular surgery ~~services to ambulatory~~ patients in ~~the ambulatory-outpatient setting~~ ~~facilities~~, such as an ASC or OBL ~~while COVID-19 vaccination is being implemented~~  Furthermore, ~~in the context of~~ ~~during~~ the COVID-19 pandemic, ~~we believe that providing~~ essential care in ~~the ambulatory-setting~~ ~~an outpatient setting~~, when available, is ~~the superior option in comparison-preferable~~ to ~~providing~~ similar care ~~provided in the-a~~ hospital setting ~~owing~~. ~~This is due~~ to the decreased touch points inherent to care provided ~~number of contacts between patients and healthcare providers in the ambulatory setting as well as and~~ the reduction of hospital resource utilization ~~at a time during a period~~ when ~~they are already stretched thin~~ ~~resources are limited~~.

5. Conclusions

~~Our~~ ~~This~~ retrospective study evaluated the ~~impact-effect~~ of ~~utilization of the~~ COVID-19 ~~restrictions on the use of~~ ASC and OBL ~~venues-facilities~~ for ~~providing~~ essential vascular care in

an ambulatory ~~patients in a single vascular surgery group environment~~ during the early phase of the COVID-19 pandemic ~~for a single vascular surgery group.~~ -

Acknowledgments

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