HIGH PREVALENCE OF CHRONIC VENOUS DISEASE AMONG HEALTH CARE WORKERS IN GENERAL HOSPITALS AT MAKKAH.

Rakan Ali Yamani[1*], Hmeed Mohammad Kheder Alharbi[2], Abdulrahman Ahmed Alzahrani[3], Omneya Ahmad AbuGayed[4], Hanaa Ibrahim Jaleisa[5], Amal Mohmmed Jaffary[6], Naif Ogab Jabr Alotabi[7], Fatma HMEDIN AlEjefi[8], Naif Mohammed Ahmed Babakour[9], Abdulaziz Hussain Muyidi[10], Fahad Amer Alotibi[11], Abdullah Saeed Aalehyani[12], Khalaf Radah Alotaibi[13], Moataz Salahaddin aljawi[14], Ibraheem Hamid Alzahrani[15], Ayman Amour Al-Otaibi[16]

Abstract:
Health care workers spend extended times standing and walking short distances and are at risk for development of chronic venous insufficiency (CVI). We conducted a hospital-wide venous screening program designed to measure the prevalence of and risk factors for clinical manifestations of CVI and ultrasound evidence of venous reflux or obstruction in health care workers. We also determined their risk for deep venous thrombosis (DVT).
Methods: Free venous screening and education were offered to all hospital employees; the program started in January 2022, and results are presented from the first year. Demographics, medical history, and use of compression stockings were recorded. A physical examination determined the clinical class of the Clinical, Etiology, Anatomy, and Pathophysiology (CEAP) classification for clinical disease, and an ultrasound test evaluated for reflux or obstruction in the common femoral vein, popliteal vein, and saphenofemoral junction. The Caprini score was recorded to evaluate risk of DVT. Descriptive statistics were reported, and logistic regression was used for multivariate analysis of risk factors.
Results: We enrolled 636 participants (1272 legs); 93.0% were women. The median age was 42 years (interquartile range, 31-52 years), mean body mass index was 29.2 ± 6.6 kg/m^2, and most participants were white (49.1%) or African American (39.5%); 18% reported having hypertension, 7.1% had diabetes, and 6.1% were current smokers. The majority reported occasional leg pain (72.7%) and evening leg swelling (42.3%). Only 2.7% used daily compression stockings. Clinical evidence of CVI was present in at least one leg in 69.1% (C1, 49.0%; C2, 17.7%; C3, 1.9%; C4, 0.2%; C5, 0.2%). Venous reflux was present in at least one leg in 82.1%; obstruction was rare (0.2%). Reflux in either the superficial (saphenofemoral junction) or the deep (femoral or popliteal) venous system was present in the majority (71.0%) of patients with CVI (clinical class ≥C1). Reflux and white race were risk factors for clinical disease; clinical disease, age, female sex, and white race were risk factors for reflux. On the basis of the Caprini score, 14.1% of participants were in the highest risk category for DVT when experiencing a high-risk situation (including 2.2% with history of DVT).
Conclusions: Prevalence of clinical CVI and venous reflux is high among health care workers despite a low frequency of cardiovascular comorbidities. Increased awareness about CVI and DVT and preventive strategies for venous disease must be instituted in this high-risk cohort.

Keywords: Chronic venous insufficiency, Venous reflux, Varicose veins, Health care workers, Deep venous thrombosis

[1*]Consultant orthopedic surgeon, King Abdulaziz Hospital Makkah, Saudi Arabia.
[2]Nursing technician, Khalidiya Health center makkah, Saudi Arabia.
[3]Health services management, AlNoor hospital specialists makkah, Saudi Arabia.
[4]Family medicine specialist, Makkah Al-Mukarramah cluster - Batha Quraysh Health Center, Saudi Arabia.
[5]Senior Nursing Administration Specialist, Makkah Al-Mukarramah cluster – Hajj street Health Center, Saudi Arabia.
[6]Nursing specialist, King Abdulaziz Hospital Makkah, Saudi Arabia.
[7]Nursing technician, Makkah Al-Mukarramah cluster – madrakh Health Center, Saudi Arabia.
[8]Nursing specialist, Makkah Al-Mukarramah cluster – madrakh Health Center, Saudi Arabia.
[9]Pharmacy technician, Ajyad emergency hospital Makkah, Saudi Arabia.
[10]Radiological Technician, General Directorate of Health Affairs of Makkah Region, Saudi Arabia.
[11]Nursing Technician, Shamansir Health Center Makkah, Saudi Arabia.
[12]Nursing Technician, General Directorate of Health Affairs of Makkah Region, Saudi Arabia.
[13]Health informatics Technician, Hira Hospital Makkah, Saudi Arabia.

[14]Nursing Technician, Alnawriah Health Center makkah, Saudi Arabia.
[15]Nursing Technician, AJYAD hospital Makkah, Saudi Arabia.
[16]Epidemiology Technician, King Abdulaziz hospital Makkah, Saudi Arabia.

***Corresponding Author:** Rakan Ali Yamani
*Consultant orthopedic surgeon, King Abdulaziz Hospital Makkah, Saudi Arabia.

DOI: 10.53555/ecb/2022.11.02.056

Introduction:

Chronic venous insufficiency (CVI) resulting from venous reflux or obstruction leads to venous hypertension with consequent pain, edema, varicose veins, hyperpigmentation, and ulceration of the lower extremities (Cires-Drouet et al., 2020; Eberhardt & Raffetto., 2014) . CVI affects 25 million adults in the United States, with nearly 6 million suffering from advanced disease, and the annual cost of venous ulcer care is estimated to be $3 billion. In addition, CVI accounts for a loss of 2 million workdays per year, and almost 12% seek early retirement (Rabe et al., 2016).

Female sex, pregnancy, prolonged standing, obesity, sedentary lifestyle, venous reflux or obstruction, and deep venous thrombosis (DVT) are suspected risk factors for CVI (defined by clinical class ≥C1 of the Clinical, Etiology, Anatomy, and Pathophysiology [CEAP] classification). Women form >90% of the national health care workforce (Auerbach et al., 2011). These workers spend extended periods standing and walking short distances and may therefore be at risk for development of CVI. Although risk factors for CVI are common among health care workers, only two studies have assessed its prevalence in this population, and they have reported different rates (34% and 62%) (Diken et al., 2016; Ziegler et al., 2003).

We conducted a hospital-wide venous screening program of health care workers with aims to measure the prevalence of CVI and venous reflux, to determine the risk for DVT, to assess the relationship between venous reflux and clinical disease (CVI), and to identify potential risk factors for CVI and venous reflux in this cohort.

Materials and Method:

Subjects:

We initiated a free venous screening program in January 2022 at the general hospitals, Makkah, Saudi Arabia. All hospital employees were eligible to participate. The study was approved by the ethical committee; all participants provided assent for the study, and we reported information collected from 1 year of enrollment.

Data collection:

Participants completed a questionnaire detailing demographics, medical history, current medications, and compression stocking use. A nurse specialist performed a physical examination for determination of clinical class of the CEAP classification (C0, no signs of CVI; C1, venous telangiectasias; C2, varicose veins; C3, edema; C4, venous stasis and skin changes; C5, healed venous ulcers; and C6, open venous ulcers) (Gloviczki et al., 2011).

An abbreviated venous duplex ultrasound (DUS) examination was performed by a trained vascular sonographer using a Philips CX-50 machine with a 9 MHz linear transducer (Philips, Amsterdam, The Netherlands). It included bilateral evaluation of deep (common femoral vein [CFV] and popliteal vein [PV]) and superficial (saphenofemoral junction [SFJ]) venous systems for reflux and obstruction. Venous reflux was evaluated while the participant performed a Valsalva maneuver or by mechanical compression of the calf. Venous reflux was defined as flow reversal ≥0.5 second. Because of lack of universally accepted criteria, it was decided to use the same protocol as in the national screening program for venous disease (McLafferty et al., 2007).

Inability to occlude vein walls by compression during B-mode imaging or a lack of flow on Doppler imaging was considered indicative of venous obstruction. A self-reported Caprini score was obtained to determine risk for DVT development. The score stratified 30-day risk for DVT if the individual were to be exposed to a high-risk situation, such as surgery or trauma. The numerical value represents a weighted score of risk factors for DVT with the scores classifying DVT risk distributed into five groups: 0, <0.5% risk; 1 or 2, 1.5% risk; 3 or 4, 3% risk; 5 to 8, 6% risk; and >8, 6% to 18% risk (Obi et al., 2015; Pannucci et al., 2012)

Statistical analysis

Cross-tabulations were used to describe the association of CVI (C0 vs C1-C6) with reflux (present vs absent) and the relationship between anatomic reflux and CVI (ipsilateral vs contralateral). To understand the extent of disease (CVI and reflux) within individuals, we performed two separate analyses: first, cross-tabulation of clinical class of CEAP classification in one leg (C0-C6) against clinical class of the contralateral leg; and second, cross-tabulation of reflux location in one leg (reflux in CFV, PV, SFJ, CFV + PV, CFV + SFJ, PV + SFJ, CFV + PV + SFJ) against reflux location in the contralateral leg. This approach helped delineate bilateral vs unilateral CVI; when bilateral disease was present, analyses provided a comparison of disease in both legs in terms of severity and anatomic location. We further examined the association of severity of CVI (C0-C6) with reflux location (no reflux or reflux in the superficial [SFJ], deep [CFV ± PV], or combined

superficial and deep [SFJ ± FV ± PV] veins). Logistic regression was used to determine the relation of risk factors with two outcome measures, risk for CVI (defined as C0 vs C1-C6) and reflux (present vs absent), in separate analyses. Both analyses were adjusted for age, sex, body mass index (BMI), family history of thrombosis, history of smoking (yes or no), and race (white or African American). The analysis examining risk for CVI was additionally adjusted for reflux (present vs absent), and the analysis examining risk for reflux was additionally adjusted for clinical class (C0 vs C1-C6). Both legs were accounted for in each participant for this analysis. We used generalized estimating equations with an unstructured covariance matrix to account for serial autocorrelation of data coming from the same participants. The statistical significance of the two-tailed analyses was set at ≤ .05. Data were analyzed using SAS 9.3 software (SAS Institute Inc, Cary, NC).

Results

Table I outlines the baseline characteristics of 636 participants (1272 legs) enrolled in the study. The majority of participants were women (93%), and the median age was 42 years (interquartile range [IQR], 31-52 years). Participants were relatively healthy; only 6.1% were current smokers, with a low prevalence of cardiovascular and other comorbidities (hypertension, diabetes mellitus, congestive heart failure) and a mean BMI of 29.2 kg/m^2 (standard deviation, ±6.6 kg/m^2). Long-term anticoagulant use was uncommon (aspirin, 6.4%; clopidogrel, 0.5%; warfarin, 0.3%). Of the participants, 73% experienced occasional leg pain; 42.3% reported leg swelling in the evening within the last 30 days (data not shown), and only 2.7% reported daily use of compression stockings. Only a minority of participants demonstrated neither CVI nor reflux (7.9%); combined CVI and reflux occurred in 58.6% (right leg only, 13.7%; left leg only, 12.2%; bilateral disease, 32.7%). The remaining 33.5% presented with either CVI or reflux (bilateral reflux and no CVI, 23.3%; bilateral CVI and no reflux, 10.2%; Fig 1).

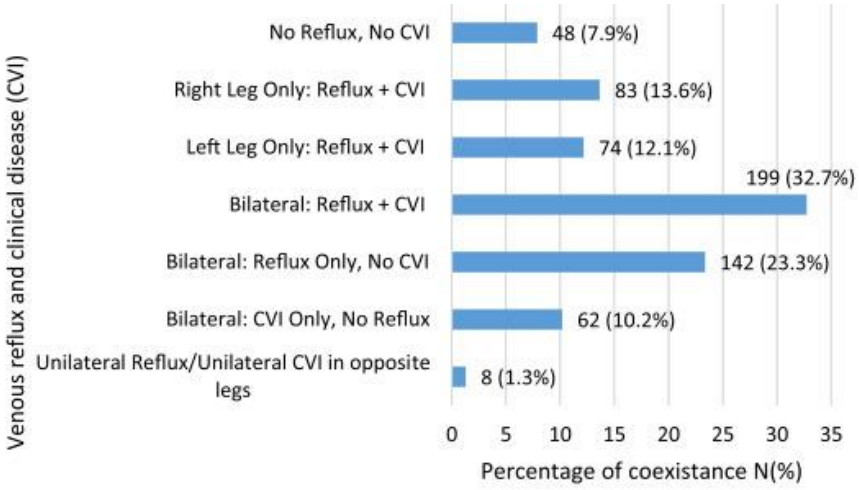
Table 1: baseline characteristics of participants:

Characteristics[a]		
Age, years	42 6 31-52	**(22-73)**
BMI, kg/m^2	29.2 6 6.6	**(15-52)**
Female	587	**(93.0)**
Diabetes	45	**(7.1)**
Hypertension	119	**(18.8)**
Congestive heart failure	3	**(0.5)**
Smoking		
Never smoker	461	**(73.4)**
Former smoker	129	**(20.5)**
Current smoker	38	**(6.1)**
Medications (antiplatelet, anticoagulant)		
Aspirin	40	**(6.4)**
Clopidogrel	3	**(0.5)**
Warfarin	2	**(0.3)**
Use of compression stockings		
Daily compression	16	**(2.7)**

***BMI,* Body mass index.**

Categorical variables are presented as number (%). Continuous vari- ables are presented as mean 6 standard deviation (range) or median 6 interquartile range (range).

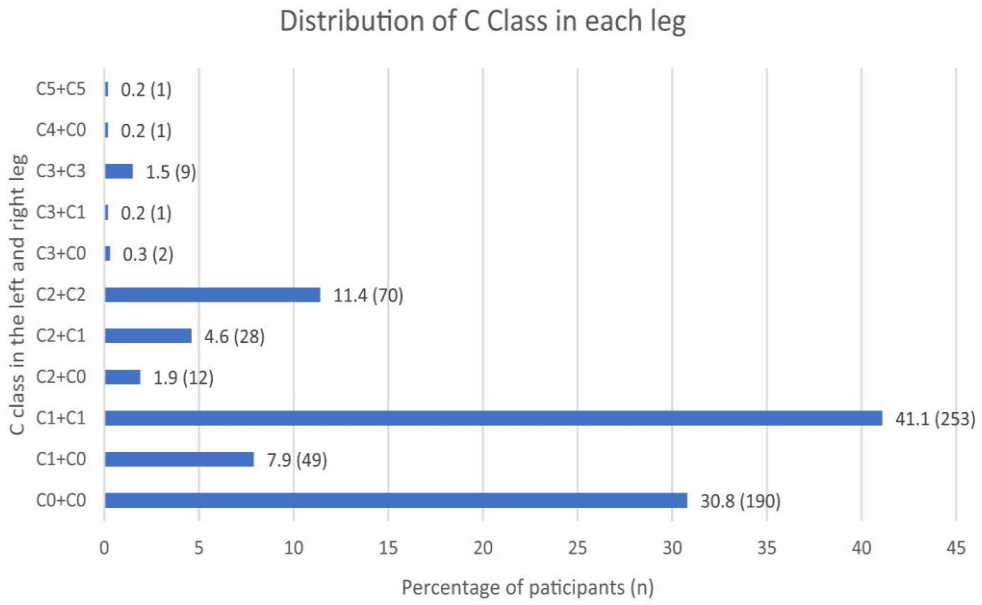
[a]Percentages are calculated on the basis of a total number of 628 for age, 613 for BMI, 631 for sex, 470 for race, 631 for diabetes, 632 for hy- pertension and congestive heart failure, 628 for smoking, and 627 for medications.



** CVI is defined as C≥1 of the CEAP (Clinical Etiologic Anatomic Pathophysiologic) classification of chronic venous insufficiency*

*** Complete data was available for 616 participants*

Clinical disease (CVI). Of the participants, 199 (30.8%) demonstrated no evidence of CVI in either leg. The remaining 69.1% exhibited CVI (C1-C6) in at least one leg (median clinical class score, 1; IQR, 0-1). In most instances, CVI was mild (C1); 7.9% presented with unilateral disease and 41.0% with bilateral disease. Overall, CVI (C1-C6) was more often noted to be bilateral (58.4%) than unilateral (10.4%); 11% presented with bilateral C2 disease, 1.4% with bilateral C3 disease, and 0.1% with bilateral C5 disease. None of the participants had active venous ulcers (C6; Fig 2). There was no difference in the distribution of disease class between the right and left legs (P = .9).



Venous reflux. Only 110 (17.8%) participants had no evidence of reflux. Most participants (82.1%) demonstrated reflux in at least one of the three veins evaluated in at least one leg. Reflux was most commonly noted in the CFV, either alone (19.1% unilaterally; 17.2% bilaterally) or concomitantly (PV, SFJ, or both), unilaterally or bilaterally (31.8%). Presence of reflux in all three veins was noted in 4 (0.6%) participants unilaterally, as a combination with veins of the contralateral leg in 37 (5.7%) participants, and bilaterally in 7 (1.1%) participants. There was no difference in reflux findings between the right and left legs (P = .59). Venous obstruction (acute or chronic) was rare; only one participant (0.15%) was diagnosed with an acute DVT (right leg; Table II).

Table II. Prevalence and distribution of venous reflux on ultrasound by the affected leg

Leg 1	Leg 2											
	No	reflux	CFV		PV	SFJ	CFV + PV	CFV + SFJ	PV + SFJ	CFV	+ PV	+ SFJ
No reflux	110	(17.8)										
CFV	118	(19.1)	106	(17.2)								
PV	11	(1.7)	8	(1.2)	e							
SFJ	20	(3.2)	10	(1.6)	e	7 (1.1)						
CFV + PV	5	(0.8)	18	(2.9)	e	3 (0.4)	7 (1.1)					
CFV + SFJ	32	(5.1)	61	(9.9)	1 (0.1)	5 (0.8)	8 (1.2)	33 (5.3)				
PV + SFJ	2	(0.3)	2	(0.3)	e	e	e	1 (0.1)	e			
CFV + PV + SFJ	4	(0.6)	11	(1.7)	e	5 (0.8)	3 (0.4)	15 (2.4)	3 (0.4)	7 (1.1)		

CFV, Common femoral vein; *PV*, popliteal vein; *SFJ*, saphenofemoral junction.
Cross-tabulation of observed reflux in each leg of a participant among the 616 participants. Each cell gives the number (percentage) of participants with a combination of reflux location in each of their legs. For example, there were 61 participants who had reflux in the PV + SFJ in one leg and reflux in the CFV in the other leg. These 61 participants represented 9.9% of the total number of participants. A dash indicates that the particular combination of reflux patterns was not observed in any participant (eg, reflux of the PV in one leg plus reflux of the SFJ in the other leg was not observed in any participant).

Risk factors for CVI and venous reflux. Among participant legs with any CVI (C1-C6), venous reflux was found most often in the deep veins (CFV or PV or both), followed by a combination of superficial and deep veins (SFJ + CFV, SFJ + PV, or SFJ + CFV + PV) and least frequently in the superficial system (SFJ) alone (Table III). In legs with mild CVI (C1), 71.0% showed reflux in at least one vein, most often in the deep veins (CVF 6 PV). In legs with C2 CVI, 68.9% showed reflux in at least one vein, again most commonly in the deep veins. Few legs presented with advanced CVI (C3-C5), and these also demonstrated reflux most frequently in the deep veins.

Although there was a significant difference in CVI prevalence by race (increased prevalence in white participants, $P = .045$, Fisher exact test), age had no effect on the distribution of clinical class. Venous reflux (odds ratio [OR], 1.77; 95% confidence interval [CI], 1.31-2.40) and white vs African American race (OR, 1.54; 95% CI, 1.08-2.21) were independent risk factors for CVI. Clinical disease (OR, 1.77; 95% CI, 1.31-2.39), each year of increasing age (OR, 1.06; 95% CI, 1.04-1.09), male sex (OR, 0.14; 95% CI, 0.05-0.37), and being white vs African American (OR, 1.63; 95% CI, 1.03-2.58) were independent risk factors for reflux. There was no difference in mean BMI between participants with bilateral CVI and no reflux and the rest of the cohort ($P = .62$).

Risk for DVT. The median Caprini score for participants (n = 630) was 2.5 (IQR, 1-3). Scores were between 5 and 8 among 14% of participants, indicating #6% DVT risk; one participant scored >8, indicating #18% DVT risk. Reponses to individual questions demonstrated a mixed cohort with several risk factors for subsequent DVT events; 2.2% had a history of DVT, 15.3% had a family his- tory of DVT, 15.9% self-reported daily leg swelling, and 65.2% self-reported varicose veins. Other comorbidities reported were inflammatory bowel disease (4.7%), chronic obstructive pulmonary disease (0.8%), heart dis- ease (1.9%), and cancer (4.6%). Prolonged bed rest was reported among 3.3%, 0.5% had a history of bone fracture requiring a cast, 0.6% had prior surgery, and 3.5% were pregnant. Use of birth control hormones was reported by 22.6%, and 6.3% self-reported weight >250 pounds.

Table III. Distribution of reflux in individual venous segments (deep, superficial, or combined) by clinical disease (chronic venous insufficiency [CVI]) class per leg

CEAP class	Anatomic location of reflux, No. (%)					
	No reflux		Superficial (SFJ)	Deep (CFV or PV or both)	Combined (SFJ and CFV or PV or all three)	
0	158	(41.5)	17 (4.4)	138 (36.3)	67 (17.6)	
1	175	(28.9)	27 (4.4)	280 (46.3)	122	(20.2)
2	68	(31.0)	13 (5)	80 (36.5)	58	(26.4)
3	10	(41.6)	0	11 (45.8)	3	(12.5)
4		0	0	2 (100)		0
5		0	0	0	2	(100)
6		0	0	0		0

CEAP, Clinical, Etiology, Anatomy, and Pathophysiology; *CFV*, common femoral vein; *PV*, popliteal vein; *SFJ*, saphenofemoral junction.
Percentages are row percentages.

Discussion:

We implemented a standardized venous screening program in a large population of hospital employees. The four components of the program included a clinical evaluation for CVI, a DUS examination for venous reflux or obstruction, a DVT risk screening tool, and an exit inter- view with a physician or trained allied health professional. In this cohort of otherwise healthy health care workers, 69% have evidence of CVI, 82% have venous reflux, and 14% are at high risk for DVT. Female sex and white race are risk factors for venous reflux and CVI.

The estimated prevalence of CVI ranges from 5% to 30% in adults (Eberhardt & Raffetto., 2014). Reports of prevalence vary according to the definition used, cohorts studied, and protocols used for diagnosis. Before 1994, CVI was defined on the basis of the presence of visible varicose veins (Basel classification) (Barras et al., 1991). The CEAP classification was subsequently developed and later revised in 2004 to include sensitive and specific clinical features. The Edinburgh Vein Study used the Basel classification and DUS to report a prevalence of 39.7% in men and 32.2% in women in the general population, and the Framingham study found similar rates of 40% to 50% (Porter et al., 1995; Evans et al., 1999: Rabe et al., 2012). Whereas the Vein Consult Program and the national pilot screening program for venous disease reported higher rates (63.9% and up to 81.8%, respectively), these may have been overestimates because screening was offered to patients. Only two smaller studies have assessed the prevalence of CVI among hospital workers, and they reported different results (33.4% and 50.4%) but concluded that working in a hospital increased the risk for CVI (McLafferty et al., 2007; Diken et al., 2016; Ziegler et al., 2003). Their reported prevalence was lower than our findings. Whereas both studies used $C1 as a definition of CVI, one study recruited patients during annual vaccination visits, and the other excluded participants with comorbidities that could mimic CVI (Beebe-Dimmer et al., 2005; Auerbach et al., 2011). Advanced CVI was more common than in our cohort and may be a result of a selection bias. Ziegler et al., 2003 found 11.4% of participants with C3 disease and 4.7% with C4 disease, whereas Diken et al (2016) reported 7.3% with C3 disease and 3% with C4 disease compared with this study, in which only one patient each was identified with C4 and C5 disease. Our study was likely to have been less subject to selection bias because it was advertised as a free screening program for employees and excluded hospital patients. Studies of the general population have similarly reported higher numbers for advanced CVI, a possible result of self-referred participants with known leg discomfort (Rabe et al., 2012; McLafferty et al., 2007; Carpentier et al., 2004).

Early CVI is therefore highly prevalent among health care workers and more prevalent than has been previously suspected. Female sex, increasing age, standing jobs, sedentary lifestyles, and obesity have been implicated as risk factors for CVI and may collectively have contributed to the increased rates of CVI observed in our cohort (Beebe-Dimmer et al., 2005). Previous studies indicate a higher prevalence of varicose veins in women, although one study has reported a higher rate among men (Evans et al., 1999). The risk can be explained by biochemical and hemodynamic changes during pregnancy because multiparous women have higher rates of CVI than nulliparous women do (Vin et al., 1999). Nationwide, women represent the majority of health care workers (90%) and nursing staff as reflected in our cohort, of which 93.0% were female. This increased representation is higher than in previous analyses for CVI in health care workers (79.3% and 77.0%) and is also higher than in previous general population studies (Diken et al., 2016; Ziegler et al., 2003; Brand et al., 1988; Evans et al., 1998). With the relatively low numbers of men screened (n = 49) in our study, sex- related risk analyses must be interpreted with caution. However, men did demonstrate independent and significantly lower odds of venous reflux (OR, 0.14).

Age is a known risk factor for CVI. A dual case-control study comparing patients with CVI vs non-venous dis- ease patients estimated that the risk for CVI increases by 6% for each year of increase in age (Scott et al., 1995). Consistent with this observation, our study found age to be an independent risk factor for venous reflux (OR, 1.06). The median age of participants in our cohort reflects a working age population, and this was at least one to two decades younger than in studies of the general population. Despite the reduced age, we observed a high prevalence of CVI and venous reflux, suggesting a strong predisposition among health care workers.

Prolonged standing or sitting with brief periods of ambulating short distances results in venous pooling and can initiate or exaggerate venous hypertension, thereby increasing the risk of CVI (Mekky et al., 1999). In a study of 5940 workers, the risk for hospital admission from varicose veins was higher among those with jobs requiring prolonged standing compared with those that did not (relative risk, 1.85 [95% CI, 1.33-2.36] in men and 2.63 [95% CI, 2.25-3.02] in women) (Tüchsen et al., 2000). Similar limitations in physical activity are typical among

hospital workers and probably also contributed to the high prevalence of CVI observed in this study.
Obesity increases the risk of CVI and venous thromboembolism, particularly in women (Allman-Farinelli., 2011). Whereas the mean BMI in our cohort was higher than in some studies of the general population and of hospital employees, it was similar to the BMI observed in the national pilot screening program for venous disease and others (Robertson et al., 2014). Although the overweight and obese participants may have contributed to the increased rates of CVI in our cohort, we observed only a modestly increased risk for CVI (OR, 1.03) associated with obesity.

Implementing DUS assessments is effort and resource intensive. Therefore, the majority of previous studies have reported on CVI alone, and few have incorporated DUS verification of reflux. Because symptoms and signs of CVI can overlap with other conditions (eg, leg edema in congestive heart failure), the additional measurement of reflux enhances the reliability of our observations. Only one study used DUS, reporting reflux in 52% of 28 vascular surgeons screened for CVI (Labropoulos et al., 1995). In our study, reflux was found in 82% of legs, predominantly in the deep venous system (CVF). On multivariable analysis, reflux was a strong predictor of CVI and the presence of CVI predicted reflux, confirming the pathophysiologic relationship between reflux and CVI. Of note, however, reflux contributes to the development of CVI and can occur in the absence of CVI in early stages of the disease. Further- more, reflux may not be detectable in all instances of CVI because of testing variability or patient positioning.
If placed in a situation conducive for DVT, 14% of our participants would be at high or very high risk for development of an acute DVT based on the Caprini risk scoring system. The presence of CVI, leg edema, history of DVT, and obesity are known risk factors for DVT and were prevalent in our cohort. The prevalence of high-risk individuals was, however, lower than in the national pilot screening program for venous disease and is likely related to the fact that we screened individuals working in a hospital, whereas the national pilot screening program enrolled patients who probably were self-selected for leg symptoms (Robertson et al., 2014; Gloviczki et al., 2011). This is further confirmed by the low rates of comorbidities in our cohort.

CONCLUSIONS

We implemented a standardized comprehensive venous screening program among health care workers. Chronic venous disease was surprisingly high, with almost 70% demonstrating CVI, whereas >80% had venous reflux and 14% were at high risk for DVT if exposed to a high-risk situation. After the screening pro- gram, 92.1% of those who presented with clinical evidence of CVI or venous reflux were prescribed compression stockings. The implementation of educational and preventive measures in this high-risk group is critical to preventing late complications of CVI, such as venous ulcers or DVT, on exposure to a high-risk situation. Venous screening programs will enhance awareness among sedentary working groups that increasingly exist across multiple professions.

Reference:

1. Allman-Farinelli, M. A. (2011, November). Obesity and venous thrombosis: a review. In Seminars in thrombosis and hemostasis (Vol. 37, No. 08, pp. 903-907). © Thieme Medical Publishers.
2. Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2011). Registered nurse supply grows faster than projected amid surge in new entrants ages 23–26. Health affairs, 30(12), 2286-2292.
3. Barras, J. P., Widmer, M. T., Zemp, E., Voilin, R., & Widmer, L. K. (1991). Sequelae of venous thrombosis. Incidence in of the post-thrombosis syndrome after 5 years. Journal des Maladies Vasculaires, 16(2), 115-118.
4. Beebe-Dimmer, J. L., Pfeifer, J. R., Engle, J. S., & Schottenfeld, D. (2005). The epidemiology of chronic venous insufficiency and varicose veins. Annals of epidemiology, 15(3), 175-184.
5. Brand, F. N., Dannenberg, A. L., Abbott, R. D., & Kannel, W. B. (1988). The epidemiology of varicose veins: the Framingham Study. American journal of preventive medicine, 4(2), 96-101.
6. Carpentier, P. H., Maricq, H. R., Biro, C., Ponçot-Makinen, C. O., & Franco, A. (2004). Prevalence, risk factors, and clinical patterns of chronic venous disorders of lower limbs: a population-based study in France. Journal of vascular surgery, 40(4), 650-659.
7. Cires-Drouet RS, Fangyang L, Rosenberger S, Startzel M, Kidwell M, Yokemick J, McDonald T, Carlin M, Sharma J, Sorkin JD, Lal BK. High prevalence of chronic venous disease among health care workers in the United States. J Vasc Surg Venous Lymphat Disord. 2020 Mar;8(2):224-230. doi: 10.1016/j.jvsv.2019.10.017. PMID: 32067727; PMCID: PMC7375188.
8. Diken, A. I., Yalçınkaya, A., Aksoy, E., Yılmaz, S., Özşen, K., Sarak, T., & Çağlı, K. (2016). Prevalence, presentation and occupational risk

factors of chronic venous disease in nurses. Phlebology, 31(2), 111-117.
9. Eberhardt, R. T., & Raffetto, J. D. (2014). Chronic venous insufficiency. Circulation, 130(4), 333-346.
10. Evans, C. J., Allan, P. L., Lee, A. J., Bradbury, A. W., Ruckley, C. V., & Fowkes, F. G. R. (1998). Prevalence of venous reflux in the general population on duplex scanning: the Edinburgh vein study. Journal of vascular surgery, 28(5), 767-776.
11. Evans, C. J., Fowkes, F. G. R., Ruckley, C. V., & Lee, A. J. (1999). Prevalence of varicose veins and chronic venous insufficiency in men and women in the general population: Edinburgh Vein Study. Journal of epidemiology and community health, 53(3), 149.
12. Gloviczki, P., Comerota, A. J., Dalsing, M. C., Eklof, B. G., Gillespie, D. L., Gloviczki, M. L., ... & Wakefield, T. W. (2011). The care of patients with varicose veins and associated chronic venous diseases: clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum. Journal of vascular surgery, 53(5), 2S-48S.
13. Labropoulos, N., Delis, K. T., Nicolaides, A. N., & From the Academic Surgical and Vascular Unit, S. (1995). Venous reflux in symptom-free vascular surgeons. Journal of vascular surgery, 22(2), 150-154.
14. McLafferty, R. B., Lohr, J. M., Caprini, J. A., Passman, M. A., Padberg, F. T., Rooke, T. W., ... & Wakefield, T. W. (2007). Results of the national pilot screening program for venous disease by the American Venous Forum. Journal of vascular surgery, 45(1), 142-148.
15. Mekky, S., Schilling, R. S. F., & Walford, J. (1969). Varicose veins in women cotton workers. An epidemiological study in England and Egypt. British Medical Journal, 2(5657), 591.
16. Obi, A. T., Pannucci, C. J., Nackashi, A., Abdullah, N., Alvarez, R., Bahl, V., ... & Henke, P. K. (2015). Validation of the Caprini venous thromboembolism risk assessment model in critically ill surgical patients. JAMA surgery, 150(10), 941-948.
17. Pannucci, C. J., Barta, R. J., Portschy, P. R., Dreszer, G., Hoxworth, R. E., Kalliainen, L. K., & Wilkins, E. G. (2012). Assessment of post-operative venous thromboembolism risk in plastic surgery patients using the 2005 and 2010 Caprini Risk Score. Plastic and reconstructive surgery, 130(2), 343.
18. Porter, J. M., Moneta, G. L., on Chronic, A. I. C. C., & Disease, V. (1995). Reporting standards in venous disease: an update. Journal of vascular surgery, 21(4), 635-645.
19. Rabe, E., Ballarini, S., & Lehr, L. (2016). A randomized, double-blind, placebo-controlled, clinical study on the efficacy and safety of calcium dobesilate in the treatment of chronic venous insufficiency. Phlebology, 31(4), 264-274.
20. Rabe, E., Guex, J. J., Puskas, A., & Scuderi, A. (2012). Epidemiology of chronic venous disorders in geographically diverse populations: results from the Vein Consult Program. International angiology: a journal of the International Union of Angiology, 31(2), 105-115.
21. Robertson, L. A., Evans, C. J., Lee, A. J., Allan, P. L., Ruckley, C. V., & Fowkes, F. G. R. (2014). Incidence and risk factors for venous reflux in the general population: Edinburgh Vein Study. European Journal of Vascular and Endovascular Surgery, 48(2), 208-214.
22. Scott, T. E., LaMorte, W. W., Gorin, D. R., & Menzoian, J. O. (1995). Risk factors for chronic venous insufficiency: a dual case-control study. Journal of vascular surgery, 22(5), 622-628.
23. Tüchsen, F., Krause, N., Hannerz, H., Burr, H., & Kristensen, T. S. (2000). Standing at work and varicose veins. Scandinavian journal of work, environment & health, 414-420.
24. Vin, F., Allaert, F. A., & Levardon, M. (1992). Influence of estrogens and progesterone on the venous system of the lower limbs in women. The Journal of dermatologic surgery and oncology, 18(10), 888-892.
25. Ziegler, S., Eckhardt, G., Stöger, R., Machula, J., & Rüdiger, H. W. (2003). High prevalence of chronic venous disease in hospital employees. Wiener Klinische Wochenschrift, 115.