



The Cost of Depression-Related Presenteeism in Resident Physicians

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Depression affects 5.5% of full-time workers and 7.0% of part-time workers in the USA [1]. Depression exacts an economic toll through increasing time absent from work, or absenteeism, and through time present at work but with decreased productivity, or presenteeism [1, 2].

The word presenteeism, as it refers to working while ill, is a fairly recent concept; it first appeared in the literature in the 1980s and continues to evolve [3]. Different types of work environments can create conditions for high-presenteeism levels in workers that manifest in different ways [4]. McKevitt et al. found that physicians have higher rates of presenteeism compared to those working in a similarly high-pressure job at a similar socioeconomic level, including physicians with diagnosed psychiatric illnesses [5]. Multiple attitudes, including a sense of obligation to coworkers and not wanting to be perceived as unable to cope, and organizational regulations have shaped presenteeism in healthcare and other fields [5, 6]. Presenteeism is responsible for the majority of lost productivity in the general population [1], and high-presenteeism rates may actually result in higher overall time-out sick [6].

Between 115,000 and 120,000 resident physicians currently work in US hospitals [7]. In the context of long work hours, insufficient sleep, and high-patient load, researchers are recognizing that rates of depression increase substantially with residency, with 25–30% of residents screening positive for depression [8, 9]. However, previous research has not examined the economic cost associated with depression among residents. Rates of absenteeism among residents are typically low [10, 11]; however, over 80% of physicians have worked

while ill [12], indicating that presenteeism is more likely than absenteeism to be manifestation of decreased work productivity in residents with depression. We aim to quantify the prevalence and cost of presenteeism in physicians at the end of the first 12 months of residency.

Methods

Interns in internal medicine, general surgery, pediatrics, psychiatry, emergency medicine, Med/Peds, and OB/Gyn at 55 universities received an invitation to participate in a prospective longitudinal study (See [13] for details). Depressive symptoms were assessed using the Patient Health Questionnaire (PHQ-9) [14] 1–2 months before residency and 12 months into residency. A score of 10 or greater on the PHQ-9 has a sensitivity of 93% and a specificity of 88% for major depressive disorder diagnosis [9].

Depressive symptom severity categories were defined by PHQ-9 score as follows: minimal 0–4, mild 5–9, moderate 10–14, moderate-severe 15–19, severe 20–27 [14]. Presenteeism was assessed at 12 months with the World Health Organization's Health and Work Performance Questionnaire (HPQ) Short Form, developed by Kessler and colleagues to estimate the workplace costs of health problems in terms of reduced job performance. It has shown excellent reliability and strong validity in multiple professions. Interns self-ranked their performance compared to an average resident's performance on a scale, with a higher number indicating better performance. Those numbers were converted to presenteeism scores of 0–100%, with 10, or 100%, representing working at full capacity (no presenteeism) [15, 16]. To determine what the baseline presenteeism scores would have been, we weighted the mean 12-month presenteeism score in each depression symptom severity category by the proportion of participants in each category at baseline.

Replacement cost of a resident's annual work was calculated using Green and Johnson's method published in 1995. This was

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the only study found to have published a method of quantifying the costs of replacing the work of a resident using other personnel. The study used a consensus panel at their local site to estimate three midlevel practitioners needed to replace the work of 1 resident. Salary costs to replace year 1 residents with midlevel practitioners (\$107.8 million) were divided by number of midlevel practitioners needed to replace all year 1 residents (1725) and multiplied by number of practitioners needed to replace 1 resident (3), equaling \$187,478, or \$296,000 when adjusted for inflation for 2016 using the Bureau of Labor Statistics inflation calculator [17, 18]. Cost related to presenteeism per resident was calculated by multiplying the salary costs to replace 1 resident (\$296,000) by the percentage difference in presenteeism (1.03%) and subtracting 296,000.

Statistical analyses were conducted using Stata 11.2 [19]. The University of Michigan Institutional Review Board approved this study.

Results

Of the 5150 interns invited to participate in the study, 3127 (61%) agreed to participate and completed the baseline survey, of which 1893 subjects (61%) also completed a 12-month follow-up survey. Subjects who did not complete the follow-up survey were not significantly different by age, sex, or baseline PHQ-9 score from subjects who did complete the survey ($\beta = 0.0009$, $p < 0.781$). Compared with all individuals entering internship nationally, our sample was slightly younger (1.3 years) and included a slightly higher percentage of women (2.2%). There were no significant differences specialty, institution, or demographic variables between individuals who participated and those who did not ($p > 0.05$ for all comparisons). An ANOVA test showed no significant difference in 12-month survey completion by specialty ($p = 0.05$). Bonferroni, Scheffé, and Sidak tests showed no individually significant differences.

Mean PHQ-9 score increased significantly from baseline to 12 months of residency (2.74 \rightarrow 5.33; $\beta = 0.26$, $p < 0.001$). The increase remained significant after adjusting for age and sex ($\beta = 0.25$, $p < 0.001$). At baseline, 4.48% (140/3127) of subjects met criteria for depression (PHQ-9 score of 10 or above), and at 12 months, 18.12% (343/1893) of subjects met criteria for depression. There was no significant difference in depression by specialty [$F(9, 1805) = 1.45$, $p = 0.16$]. At baseline, 80.1% of subjects had minimal, 15.4% had mild, 3.7% moderate, 0.6% moderately severe, and 0.2% severe depressive symptoms. At 12 months, 52.0% of participants had minimal, 29.8% had mild, 14.0% moderate, 3.1% moderately severe, and 1.0% severe depressive symptoms.

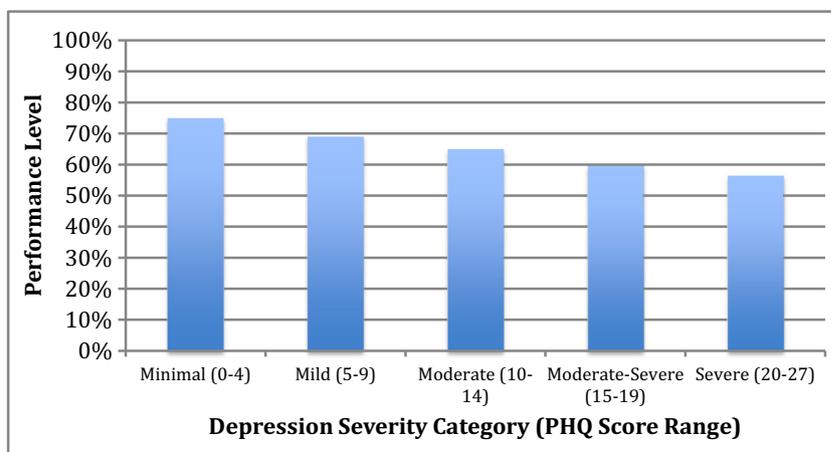
The mean presenteeism score in interns at 12 months was 70.91%, which indicates interns were operating at a 29.01% deficit relative to peak performance. Mean presenteeism score at 12 months varied significantly [$F(9, 1795) = 2.73$, $p = 0.0036$]. Mean scores ranged from 65.41 to 73.77%, with Med/Peds (65.41%) and Emergency Medicine (68.48%) having significantly worse scores. Depression (PHQ-9 score of 10 or above) during residency was significantly associated with greater presenteeism ($\beta = -1.00$, $p < 0.0001$), which remained significant after adjusting for age and sex ($\beta = -0.97$, $p < 0.0001$).

Presenteeism score decreased, or worsened, as depressive symptom severity levels increased from minimal (74.8%) to mild (68.9%), moderate (64.8%), moderately severe (59.8%), and severe (56.3%) (Fig. 1). If depressive symptom levels had remained the same at 12 months as at baseline, the mean presenteeism score would have been 3.5% higher, or better, during residency (73.39 vs. 70.91%).

Discussion

We identified substantial presenteeism among interns with depressive symptoms. We assessed depressive symptoms before (pre) and after (post) the intern year stress to determine

Fig. 1 Presenteeism score by PHQ depression severity in resident physicians at 12 months of residency



change with a powerful within-subject design. Based on prior studies, we conceptualize presenteeism as a state phenomenon that can wax and wane over time, likely mirroring variation in depressive symptoms over time.

With a resident's estimated work value of \$296,000, the presenteeism-related cost is \$10,367.93 higher per resident than if depressive symptom level during residency was unchanged from depressive symptom level before residency. Across all residents working in the USA, we estimate an added cost of \$1,226,142,642.28 attributable to depression-related presenteeism, suggesting that residents' depression is a hidden source of higher residency program and healthcare costs nationwide.

With greater recognition of the high rate of depression and burnout in residents, residency programs and hospital systems are exploring numerous initiatives to help reduce the rates of depression [20]. For instance, improving access to free, confidential mental health treatment and structural changes to reduce clerical burden and work compression hold the promise to improve depression rates. Unfortunately, the costs associated with the implementation of these and other initiatives can limit their adoption. As decision makers weigh these changes, the potential of initiatives that reduce depression to save costs through decreasing presenteeism should be considered.

This study had limitations. First, subjects were comprised exclusively of interns, and the study was conducted via a convenience sample. Though most studies do not find a difference in depression between interns and more senior house officers and effort was paid to ensure hospitals of all types, sizes, and geographic regions were included, it is important to note that this sample is non-representative sample of all US residents [8, 9]. Second, depressive symptoms and presenteeism were measured using self-assessment rather than objective assessment.

Third, study participation at 12 months of residency decreased due to attrition. Of the invited interns, 61.0% agreed to take part in our study, and among those, 61.0% completed the follow-up assessment. While it is possible that the response pattern biases our results, we do not find substantial differences in demographic or mood-related characteristics between responders and non-responders. Fourth, our study likely underestimates the overall cost of depression costs because we only quantify the presenteeism costs related to depression. However, the cost due to presenteeism may have been overestimated, as the original authors of the method used acknowledged a possible overestimate of the number of midlevel practitioners needed to replace one resident.

Fifth, following the model of previous studies that have assessed the relationship between depression and presenteeism in the general population, we did not comprehensively assess possible confounding factors. While most independent factors (such as a sick child or flu) are not likely to increase with internship to the degree that depression does, confounding is possible. The established effects of depression on absenteeism,

long-term health outcomes, and suicide are also not addressed in this analysis.

Because of the unique value of their work and the high prevalence of depression, the financial cost of depression-related presenteeism among residents is substantial. As residency programs, institutions, and accrediting agencies weigh costs and benefits of interventions to reduce depression during residency [20], hidden depression cost should be considered. Our hope is that this study is the beginning of more research into resident wellness. If program directors are able to see at what capacity their residents are performing, they may be motivated to increase wellness interventions such as anonymous counseling and also to evaluate their program for opportunities to improve working conditions.

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Compliance with Ethical Standards The funding agencies played no role in the design and conduct of the study, the collection, management, analysis, or interpretation of the data or the preparation, review, or approval of the manuscript.

Ethical Considerations An informed consent process was used when enrolling participants in this study. This study was approved by the University of Michigan Institutional Review Board.

Disclosures On behalf of all authors, the corresponding author states that there is no conflict of interest.

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