Pediatric Residents' Perception of Medical Education, General Wellness and Patient Care Following the Shortening of Shifts during the COVID-19 Pandemic

Eytan Damari MD[1,2], Alon Farfel MD[1,2], Itai Berger MD[1,2,3], Reut Ron[4], and Yonatan Yeshayahu MD[1,2]

[1]Department of Pediatrics, Assuta Ashdod University Medical Center, Ashdod, Israel
[2]Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel
[3]School of Social Work and Social Welfare, Hadassah-Hebrew University Medical Center (Mount Scopus Campus), Jerusalem, Israel
[4]Health Policy Research Analyst, Assuta Health Services Research Institute, Tel Aviv, Israel

ABSTRACT **Background:** The effect of extended shift length on pediatric residency is controversial. Israeli residents perform shifts extending up to 26 hours, a practice leading to general dissatisfaction. In early 2020, during the coronavirus disease-2019 (COVID-19) pandemic, many Israeli hospitals transitioned from 26-hour shifts to 13-hour shifts in fixed teams (capsules) followed by a 24-hour rest period at home. The regulation changes enacted by the Israeli government during the COVID-19 pandemic provided a rare opportunity to assess perception by residents regarding length of shifts before and after the change.

Objectives: To assess perception of pediatric residency in three aspects: resident wellness, ability to deliver quality healthcare, and acquisition of medical education following the change to the shorter shifts model.

Methods: We performed a prospective observational study among pediatric residents. Residents completed an online self-assessment questionnaire before and after the COVID-19 emergency regulations changed toward shorter shifts.

Results: Sixty-seven residents answered the questionnaires before (37) and after (30) the shift changes. The average score was significantly better for the 13-hour shifts versus the 26-hour shifts, except for questions regarding available time for research. There was a positive perception regarding the shorter night shifts model among pediatric residents, with an increase in general satisfaction and improvement in perception of general wellness, ability to deliver quality healthcare, and medical education acquisition.

Conclusions: Following the change to shorter shift length, perception of pediatric residents included improvement in wellness, ability to deliver quality healthcare, and availability of medical education.

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KEY WORDS: coronavirus disease-2019 (COVID-19), extended working hours, medical residency, night shifts, pediatrics

During the 4.5 years of pediatric residency in Israel, residents are required to perform 26-hour shifts up to 8 times per month in addition to their routine daily working hours [1].

The impact of the length of extended night shifts on residents' well-being and patient safety remains a debatable subject. Medical associations and hospitals worldwide are seeking the ideal working model to balance service, education, training, patient safety, and resident well-being and quality of life [2].

Currently in Israel, residents work in extended shifts that last 26 hours. A recent survey performed among Israeli residents (N=533) estimated that during an average night shift, residents sleep for approximately 54 minutes [3]. In the last decade, some countries have enforced regulations on resident working hours, limiting night shifts up to 12–16 hours [4]. The main regulatory change that took effect in 2011 by the European Union led to numerous studies on the subject, showing that this change increased residents' sleeping hours, but data regarding improvement in resident education efficiency, patient safety, and decreasing medical errors is still inconclusive [5-9].

Whether the shortening of residents' shifts has a positive or negative impact on general resident well-being, educational experience, and patient safety is still debatable. The negative impact of extended working hours resulting in sleep deprivation has been well studied, demonstrating suboptimal medical judgment in addition to decreased general well-being of medical residents [8,10-15]. Barger et al. [5] showed that tired residents working longer hours led to preventable errors, which may harm the patients. Landrigan et al. [8] argued that limitations on duty hours will interrupt continuity of patient care, thus increasing the risk of medical errors.

Local regulations and requirements resulted in different shift models (e.g., medical vs. surgical residencies) make it difficult to compare different models and compile high quality data to guide policy changes.

During the recent coronavirus disease-2019 (COVID-19) outbreak starting in early 2020 [16], regulation changes en-

acted by the Israeli government provided a rare opportunity to assess remodeling of the classic shift pattern in Israel. Prior to this remodeling, pediatric residents worked 8 hours daily (08:00–16:00), and up to 8 times a month they were required to continue into the night shifts, that is, an additional 18 hours shift (16:00–10:00), resulting in a total of 26 hours worked consecutively. The remodeling resulted in working hours being divided into 13-hour blocks, morning (08:00–21:00) and evening (20:00–09:00) alternately, working in fixed teams (capsules), followed by a 24-hour rest period at home, without changing the total working hours [17].

The purpose of this change was to decrease COVID-19 exposure among the medical workforce without changing the number of weekly working hours per resident. This change created the opportunity to evaluate the short shift model and its effects on different aspects of pediatric residency.

Our aim was to assess pediatric residents' perception regarding their general well-being, ability to deliver quality medicine, and educational opportunities following this change.

PATIENTS AND METHODS

STUDY DESIGN

We performed a prospective cohort study comparing residents' perceptions of shift duration models, using pre- (26 hours) and post-change (13 hours) questionnaires.

Study design was based on similar studies conducted by Fabreau et al. [18] and Moeller et al. [14]. A validated questionnaire used by the Fabreau group measured variables in three major domains: resident wellness, ability to deliver quality healthcare, and medical education experience. Our questionnaire used the modified questionnaire by Moeller and included a total of 32 questions based on the original questionnaire (used with permission [18]). Questions 1–25, 35–36, 38–39, 41, 45, and 47 were included and were translated to Hebrew by a bilingual physician who is fluent in both languages [Figure 1]. We excluded 17 questions from the original questionnaire due to their irrelevance to the Israeli residents' shift model.

Residents were asked to complete an anonymous online questionnaire prior to the change to 13-hour shifts on 19 March 2020 and a second identical survey 6 weeks later, after the return to the 26-hour shift model on 3 May 2020.

Residents were asked to assess their current health status before and after shift change using a self-assessment questionnaire, and to rank their agreement with the statements presented in the question using a Likert-type scale from 1 to 5: Strongly disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), Strongly agree (5), [Figure 1]. Demographic information included age, gender, year of residency, and number of children.

Study population included pediatric residents working before and during the COVID-19 shift model changes implemented at Assuta Ashdod University Hospital and Safra Children's Hospital, Sheba Medical Center. Exclusion criteria included residents who did not participate in the 13-hour shift change.

The study was approved by the Assuta Ashdod University Medical Center institutional review board.

STATISTICAL ANALYSIS

The 32 individual Likert-type scale items were grouped into 11 major domains, applying reverse coding where needed, according to guidelines under which the questionnaire was constructed [18]. Major domain scale scores were calculated by summing the individual Likert item scores and dividing by the number of items for a standardized scale score between 1 and 5. Differences in scale scores for 26-hour shifts versus 13-hour shifts were presented as means and compared using the *t*-test for different samples. To determine the multiple comparisons defined under each of the three major outcome domains (resident wellness, ability to deliver quality healthcare, and medical education experience), a P value of < 0.01 was used to indicate a statistically significant difference. Data analysis was performed using the computing environment R [19].

RESULTS

In total, 37 residents answered the questionnaire relating to the regular 26-hour shift, and 30 residents, from the same group answered the questionnaire relating to the 13-hour shift practice. Most of the responders were women between the ages of 30–35 years who were in their second or third year of residency, with 1–3 children at home [Table 1].

Results of all domains are shown in Table 2, with better scores in all three domains of resident wellness, ability to deliver quality healthcare, and medical education experience during the 13-hour shifts compared to 26-hour shifts. Only when questioned regarding available time for research, better results were achieved in the 26-hour shift questions.

Significant differences between the groups were reflected in almost all topics by questions regarding residents' ability to participate in physical activity, feel confident while driving home, and spend time with family as well as general energy levels [Table 3].

DISCUSSION

The COVID-19 pandemic led to a change in the working hours of Israeli hospitals resulting in medical staff (including residents) working 13-hour shifts instead of the usual working model of 26 hours, without changing the monthly total working hours. These changes provided an opportunity to assess resident's opinions regarding the different shift-hour models during residency.

In this study we found that pediatric residents showed a positive perception of the 13-hour shift model, reflected in almost all aspects questioned, except for questions dealing with time

Figure 1. Supplementary material contained in the survey administered to the residents pre- and post-shift remodeling by the Israeli government from March to April 2020

Impact on resident's wellness

Allows general wellness

1. Adversely affects my health ☐1 ☐2 ☐3 ☐4 ☐5
2. Restricts my participation in physical activity ☐1 ☐2 ☐3 ☐4 ☐5
3. Impairs my ability to adapt to circadian rhythm changes ☐1 ☐2 ☐3 ☐4 ☐5
4. Contributes to overall my fatigue levels ☐1 ☐2 ☐3 ☐4 ☐5
5. Contributes to frequent episodes of physical illness (e.g., colds) ☐1 ☐2 ☐3 ☐4 ☐5
6. Enhances my overall energy levels ☐1 ☐2 ☐3 ☐4 ☐5
7. Contributes to my need to use stimulants such as caffeine ☐1 ☐2 ☐3 ☐4 ☐5

Allows exposure to personal harm

8. Impairs safety while driving home post call ☐1 ☐2 ☐3 ☐4 ☐5
9. Allows potential for workplace harm (e.g., needlestick injuries) ☐1 ☐2 ☐3 ☐4 ☐5

Causes conflicting role demands

10. It is easy for me to trade on-call shifts with others ☐1 ☐2 ☐3 ☐4 ☐5
11. Allows me free time to accomplish my non-work-related errands ☐1 ☐2 ☐3 ☐4 ☐5
12. Provides opportunities to spend time with my family ☐1 ☐2 ☐3 ☐4 ☐5
13. Restricts my time available to do research ☐1 ☐2 ☐3 ☐4 ☐5

Allows healthy relationships

14. Allows healthy interpersonal relationships ☐1 ☐2 ☐3 ☐4 ☐5

Causes feelings of isolation

15. Causes me to feel isolated at times ☐1 ☐2 ☐3 ☐4 ☐5

Impact on ability to deliver quality healthcare

Allows potential for error

16. On the whole, do you feel alert during your procedures while on call ☐1 ☐2 ☐3 ☐4 ☐5
17. Do you commit preventable medical errors ☐1 ☐2 ☐3 ☐4 ☐5
18. Do you experience "near misses" related to poor patient care ☐1 ☐2 ☐3 ☐4 ☐5
19. I'm often too tired to provide safe patient care ☐1 ☐2 ☐3 ☐4 ☐5

Allows clinical skill expertise

20. I miss important diagnoses ☐1 ☐2 ☐3 ☐4 ☐5
21. I manage complex medical patients appropriately ☐1 ☐2 ☐3 ☐4 ☐5
22. The content of my patient care handover is accurate ☐1 ☐2 ☐3 ☐4 ☐5
23. I assume accountability for the patients I admit ☐1 ☐2 ☐3 ☐4 ☐5

Causes expenditure of emotional labor

24. My interactions with other team members are positive ☐1 ☐2 ☐3 ☐4 ☐5
25. I communicate well with patients and their families ☐1 ☐2 ☐3 ☐4 ☐5

Allows medical skills proficiency

26. I am confident in my ability to perform procedures ☐1 ☐2 ☐3 ☐4 ☐5
27. I am confident in my ability to manage unstable critically ill patients ☐1 ☐2 ☐3 ☐4 ☐5

Allows successful learning

28. I can acquire new knowledge on call ☐1 ☐2 ☐3 ☐4 ☐5
29. I can retain new knowledge on call and apply it to patient care ☐1 ☐2 ☐3 ☐4 ☐5
30. I have opportunities to learn procedures through simulation training ☐1 ☐2 ☐3 ☐4 ☐5

Causes rotation disruptions

31. My rotations are frequently interrupted due to on call duties ☐1 ☐2 ☐3 ☐4 ☐5
32. I am tired after a weekend of call and it affects my week-day rotations ☐1 ☐2 ☐3 ☐4 ☐5

Scale:
Strongly disagree - **(1)** Disagree - **(2)**
Neither agree nor disagree - **(3)** Agree - **(4)** Strongly agree - **(5)**

Table 1. Demographic characteristics of the study population

		26-hours shifts (N=37)	13-hour shifts (N=30)
Age group, years	25–29	4 (11%)	2 (7%)
	30–35	23 (62%)	21 (70%)
	35–40	9 (24%)	6 (20%)
	40 +	1 (3%)	1 (3%)
Gender	Male	10 (27%)	12 (40%)
	Female	27 (73%)	18 (60%)
Year of internship	1	12 (32%)	18 (60%)
	2	7 (19%)	4 (13%)
	3	13 (35%)	5 (17%)
	4	3 (8%)	2 (7%)
	5	2 (5%)	1 (3%)
Number of children	0	8 (22%)	6 (20%)
	1	10 (27%)	6 (20%)
	2	12 (32%)	11 (37%)
	3	7 (19%)	6 (20%)
	4+	0 (0%)	1 (3%)

Table 2. Comparison of 26-hour and 13-hour shift length

Aspects of resident self/ work affected by shift length	26-hour shifts, mean (standard error)	13-hour shifts, mean (standard error)	Differences, mean (95% confidence interval)	*P* value
Resident wellness				
Allows general wellness	3.73 (0.23)	1.58 (0.17)	-2.15 (-2.59 to -1.72)	< 0.0001
Allows exposure to personal harm	3.58 (0.23)	1.35 (0.12)	-2.23 (-2.70 to -1.76)	< 0.0001
Causes conflicting role demands	3.31 (0.23)	2.43 (0.11)	-0.89 (-1.12 to -0.65)	< 0.0001
Allows healthy relationships	3.70 (0.09)	1.60 (0.08)	-2.10 (-2.61 to -1.59)	< 0.0001
Causes feelings of isolation	3.38 (0.19)	1.60 (0.18)	-1.78 (-2.31 to -1.25)	< 0.0001
Provides opportunities to spend time with my family	3.59 (0.24)	1.28 (0.12)	-2.32 (-2.82 to -1.82)	0.0000
Ability to deliver quality healthcare				
Allows potential for error	3.18 (0.22)	1.66 (0.12)	-1.52 (-1.89 to -1.14)	< 0.0001
Allows clinical skills expertise	2.52 (0.19)	1.55 (0.12)	-0.97 (-1.27 to -0.67)	< 0.0001
Causes expenditure of emotional labor	2.19 (0.14)	1.42 (0.12)	-0.77 (-1.19 to -0.36)	0.0004
Medical education experience				
Allows medical skills proficiency	2.70 (0.14)	1.63 (0.17)	-1.07 (-1.48 to -0.66)	< 0.0001
Allows successful learning	3.32 (0.22)	2.03 (0.24)	-1.28 (-1.78 to -0.79)	< 0.0001
Causes rotation disruptions	3.70 (0.21)	2.08 (0.18)	-1.62 (-2.12 to -1.11)	< 0.0001

available for research. Residents felt that their overall general wellness, ability to deliver quality healthcare, and medical education experience increased during the 13-hour model. Even though there was a decrease in the total amount of hours residents spent at work during daytime hours (08:00–16:00), when most of academic training takes place, residents felt that their education gain was higher during the shorter shift model.

Our results correlate with a previous study conducted by Moeller and colleagues [14] on internal medicine residents with the exception that our study showed positive resident perception regarding the impact of the shift change on personal relationships with their significant other and patient care. In contrast, a similar study conducted by Fabreau [18] aimed to assess internal medical residents' perception following a 6-month pilot implementation, which consisted of duty hour restrictions with sessions on sleep hygiene, electronic shift hand-over, and simulation based medical education curriculum. Fabreau's study resulted in unaffected resident perceptions post-duty hour restriction, although participants indicated improved perception regarding personal harm. The wide range of diverse perceptions may be a result of comparison of different residencies, such as internal medicine, orthopedics, and ophthalmology.

There is a notable gap between resident perceptions of the benefits of shorter shifts and reliable data proving these benefits. A systematic review by Levine et al. [9] indicated improvement in the residents' general quality of life and in patient safety, but did not result in improvement in educational experience, while a systematic review by Bolster et al. [6] failed to show an improvement in residents' well-being and patient care with shortened shifts. Antiel el al. [20] conducted a survey among 230 surgery residents regarding the 2011 regulation intervention (16-hour limit). That study revealed that residents perceived there was decreased continuity of care with patients, decreased coordination of patient care, and reduced time spent in the operating room.

The conflicting data are a result of the differences in regulations and requirements among the diverse residencies between and within countries. In Israel today, there is an increasing demand for shorter shifts, resulting from residents' perception that such a change will improve their quality of life and patient

safety, although (to this day) definitive data dealing with these topics are still inconclusive.

LIMITATIONS

While our results show significant data in favor of positive perceptions of the shorter shift model, our study has a few limitations. The data are based on self-report and therefore are subjective and should be regarded carefully. No objective outcomes were measured; but, as this study assessed residents' perception, it is likely sufficient. Regarding academic opportunities, we assessed residents' self-report and not actual academic performance, which may have been compared. Given the short period of intervention, which lasted 5 weeks, it is unlikely that we would have been able to identify a measurable outcome of academic performance. Another potential limitation was the inherent confounding variable: the effect of the pandemic itself on the perceptions of the medical residents. Since the intervention took place during the COVID-19 pandemic, this could have had an impact on residents' general well-being; thus, affecting their response to the questions. Nevertheless, the expected effect of the pandemic on the general well-being would have been negative, and yet, the change we found was positive.

To the best of our knowledge, this is the first time in Israeli healthcare, in which short shifts are practiced by entire hospitals, and therefore the first time this working schedule could be studied.

CONCLUSIONS

A positive perception was shown regarding the shorter shifts model among Israeli pediatric residents, with a general satisfaction and improved perception of general wellness, ability to deliver quality healthcare, and medical education experience. Given the general change in the workforce worldwide, and changes in priorities of current residents, with a strong emphasis on work-life balance, it is imperative to rethink the traditional way doctors were trained and consider personal wellness and satisfaction when planning residency curriculums. Further research including larger groups and different residency programs during non-pandemic times and longer periods of follow-up are needed.

Correspondence
Dr. E. Damari
Dept. of Pediatrics, Assuta Ashdod University Medical Center, Ashdod 7747629, Israel
email: eytand@assuta.co.il

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It's my rule never to lose my temper till it would be detrimental to keep it.
Sean O'Casey (1880–1964), Irish dramatist and memoirist

Whenever you commend, add your reasons for doing so;
it is this which distinguishes the approbation of a man of sense from the flattery of sycophants and admiration of fools.
Sir Richard Steele (1672–1729), Irish writer, playwright, and politician