

The Effect of Medical Clowns on Blood Pressure Measurement in Children Presenting to the Emergency Department

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ABSTRACT **Background:** Blood pressure (BP) is routinely measured while triaging children presenting to the pediatric emergency department (PED).

Objectives: To determine whether a medical clown shortens the time to acquire a BP measurement among children undergoing triage in the PED.

Methods: The study comprised 133 children. Patients were assigned to one of two groups: with a medical clown or without a medical clown.

Results: The presence of a medical clown led to a significantly shorter time to acquire a blood pressure measurement (60 ± 23 seconds vs. 81 ± 43.5 seconds, $P < 0.001$). Clowns had a significant effect on shortening total triage length among children of Jewish ethnicity compared to Arab ethnicity (113 ± 353.6 seconds vs. 154 ± 418 seconds, $P = 0.012$).

Conclusions: Using medical clowns while measuring BP during triage when used in a culturally appropriate manner shortens time.

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KEY WORDS: blood pressure, measurement, medical clowns, triage, pediatric

Blood pressure (BP) measurement is performed during triage for every child presenting to the pediatric emergency medicine department (PED). This procedure may be troublesome for some children, and it is known to be affected by many factors including the child's anxiety, pain, irritability, or lack of cooperation as well as inadequate technique or cuff size [1,2]. As a result, incorrectly elevated BP values might be obtained and lead to repeated attempts to measure BP, which might increase the child's anxiety and irritability, and ultimately prolong triage. Silverman and colleagues [3] demonstrated that in up to 62% of high BP measurements among children, an additional attempt was not performed due to these difficulties.

In recent decades, collaboration with medical clowns has become widespread in pediatric departments [4]. Several studies have demonstrated the benefits of medical clowns in anxiety and pain reduction among pediatric patients undergoing blood tests and other invasive procedures [7–12].

To the best of our knowledge, the effect of medical clowns on BP measurements, a common procedure among pediatric patients in the PED, has not been investigated. We hypothesized that a medical clown would shorten the time to acquire a BP measurement among children undergoing triage in the PED.

PATIENTS AND METHODS

This prospective study was conducted from January 2018 to July 2018 in the pediatric emergency department at Meir Medical Center, Kfar Saba, Israel. The study was approved by the institutional Helsinki Committee. The principal investigator recruited patients during registration at the PED intake desk and prior to entering triage. Inclusion criteria consisted of children ages 0–18 years who presented to the PED. Exclusion criteria included respiratory and hemodynamically unstable children or children immediately transferred to the resuscitation room.

Following parental consent and recruitment, a convenience sample of patients was recruited and assigned to one of two groups according to the presence of a medical clown. Children were assigned to the study group during PED shifts when a medical clown was attending and to the control group when there was no attending medical clown. The study was conducted in the morning shifts (7:00 to 15:00) in both groups.

The clowns had undergone specific training, and all had over 10 years of experience in clinical work at the hospital's PED. One clown was present during each PED shift.

Techniques used to distract the children included inflating comical balloons, making funny animal sounds, playing a musical instrument, and singing funny songs. Since all the medical clowns were of Jewish ethnicity, the distraction was conducted in Hebrew. Arabic words and expressions were added when children of Arab ethnicity were triaged.

The primary outcome was the duration of BP measurement in the presence or absence of a medical clown. The secondary outcome was the overall triage duration with or without a medical clown.

Outcome measurements were recorded by an independent observer. The observer used a stopwatch and was not part of the

clinical team treating the patient. The time required to obtain a BP value was measured from application of the inflatable cuff to the acquisition of a valid BP value. The duration of the triage process was defined from the moment the child entered the triage room and until the moment she or he left.

The medical clown was present throughout the entire triage process, during which the child's initial evaluation, including vital signs (heart rate, BP, and body temperature), height and weight and general assessment including pain Visual Analogue Scale (VAS) were evaluated by the nurse.

DATA ANALYSIS

Sample size

The sample size was calculated based on the assumption that the presence of a medical clown would decrease both the number of attempts and the duration of the BP measurement process by 20%. Therefore, a sample size of 65 children was estimated to be required in each group.

Statistical analysis

Data are presented as averages and standard deviations for continuous variables and as numbers and percentages for quantitative values. Continuous variables were tested for normal distribution (Shapiro-Wilk test) and the tests were conducted accordingly. Mann-Whitney non-parametric test or *t*-test were used to compare two groups of measurable parameters, and the chi-square test was used for nominal variables. $P < 0.05$ was considered statistically significant.

RESULTS

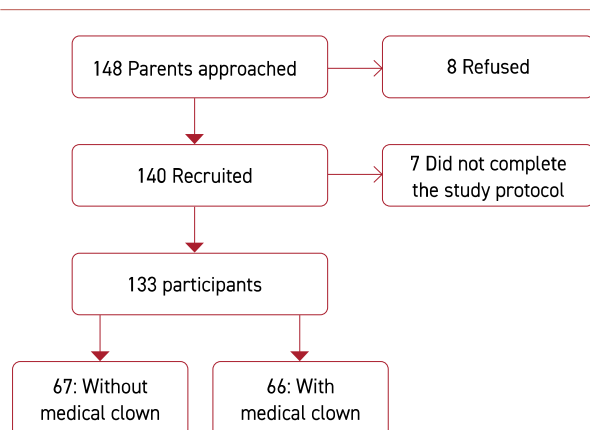
During the 6-month study period, 19,318 children were admitted to the PED. Among them, 148 children were approached, and a signed consent was provided by 140 parents. A total of 133 children completed the study and were included in the data analysis (4 children from the study group and 3 children from the control group did not complete the study protocol). Reasons for failure to complete the study protocol included parental request to discontinue the attendance of the clown and a single case of clinical exacerbation during the triage.

Among the 133 children who met the inclusion criteria, 66 were randomly assigned to the study group (clown present) and 67 children were assigned to the control group [Figure 1].

PATIENT CHARACTERISTICS

Patient characteristics (age, gender, ethnicity, reason for PED referral) were similar between the groups. The mean age of the participants was 7 ± 4.7 years (range 0.1–17 years) with a male to female ratio of 1:1.07 (69:64, respectively). Eighty percent of 133 children who completed the study were of Jewish ethnicity and 20% were of Arab ethnicity, reflecting the average distribution

Figure 1. Patient recruitment



of the children usually admitted to our PED.

Likewise, the indication for referral of the child to the PED was evenly represented in both groups (50% for trauma and 50% for other reasons). The distribution was comparable to the overall data reported for 2018 in our PED.

Vital signs, including body temperature, heart rate, blood pressure, and the quantitative VAS pain evaluation were similar between the groups [Table 1].

Table 1. Characteristics of the participants

| Characteristic | With clown | Without clown | P-value |
|------------------------------|------------|---------------|---------|
| | N=67 | N=66 | |
| 6.9 ± 4.7 | 7.1 ± 4.9 | Age, years | 0.876 |
| Male, n (%) | 36 (54.5) | 33 (49.2) | 0.269 |
| Female, n (%) | 30 (45.4) | 34 (50.7) | |
| Ethnicity | | | |
| Jewish, n (%) | 56 (84.8) | 56 (83.5) | 0.799 |
| Arab, n (%) | 10 (15.1) | 11 (16.4) | |
| Trauma | | | |
| Yes, n (%) | 33 (50%) | 34 (51%) | 0.514 |
| No, n (%) | (50%) 33 | 33 (49%) | |
| Visual Analogue Scale (pain) | 1.3 | 2.1 | 0.08 |
| Body temperature (°C) | 37.2 | 37.4 | 0.241 |
| Blood pressure, mmHg | | | |
| Systolic | 106.8 | 106.3 | 0.863 |
| Diastolic | 63.5 | 62 | 0.441 |

STUDY OUTCOMES

Time to acquire a BP measurement

The time required to obtain a BP measurement with the distraction by a medical clown was significantly shorter than without

one (60 ± 23.2 seconds vs. 81.1 ± 43.5 seconds, respectively, $P = 0.001$) [Table 2].

There was a statistically shorter time among female participants (74.7 seconds without a clown vs. 54.5 seconds with a clown, $P = 0.008$) [Table 3], which did not occur with male participants (88 seconds without a clown vs. 64.8 seconds with a clown, $P = 0.052$) [Table 3]. The time needed to complete the BP measurement in the presence of medical clowns was significantly shorter among Jewish participants (58.26 ± 22.3 seconds vs. 79.6 ± 44.3 seconds in the control, $P = 0.002$). However medical clowns did not have the same effect on Arab participants (69.6 ± 26.2 seconds vs. 87.5 ± 41 seconds, $P = 0.227$, respectively)

Table 2. Relationship between presence of the clown and the study objectives (triage time, time to obtain blood pressure measurement)

| Variable | Without clown (n=67) | With clown (n=66) | P-value |
|--|----------------------|-------------------|--------------|
| Average time of blood pressure measurement (seconds) | 81.1 ± 43.5 | 60.2 ± 23.2 | 0.001 |
| Average total triage process (seconds) | 410.4 ± 156.7 | 369.2 ± 117.6 | 0.089 |

Table 3. Relationship between demographic variables and presence of the clown and study objectives (triage time, time to obtain)

| Variable | With clown (n=66) | Without clown (n=67) | P-value |
|---|-------------------|----------------------|--------------|
| Time needed for BP measurement (seconds) | | | |
| Jewish | 58.2 ± 22.3 | 79.6 ± 44.2 | 0.002* |
| Arab | 69.6 ± 26.2 | 87.5 ± 41 | 0.227 |
| Overall triage duration (seconds) | | | |
| Jewish | 353.6 ± 113 | 419 ± 154 | 0.012 |
| Arab | 445.7 ± 114.2 | 370 ± 168.3 | 0.219 |
| Number of BP measurements | | | |
| Time needed for BP measurement (seconds) | | | |
| Male | 64.82 ± 26.3 | 88.7 ± 49.8 | 0.052 |
| Female | 54.5 ± 17.5 | 74.4 ± 36.9 | 0.008 |
| Overall triage duration (seconds) | | | |
| Male | 334.8 ± 106.3 | 396.4 ± 141.2 | 0.046 |
| Female | 411.9 ± 118.7 | 421.8 ± 169.3 | 0.789 |
| Number of BP measurements | | | |
| Time needed for BP measurement (seconds) | | | |
| Trauma | 61.7 ± 22.9 | 81.6 ± 36.7 | 0.011 |
| Other than trauma | 58.6 ± 23.8 | 80.7 ± 48.7 | 0.022 |
| Overall triage duration (seconds) | | | |
| Trauma | 320 ± 92.3 | 371 ± 132.4 | 0.078 |
| Other than trauma | 419 ± 120 | 442 ± 169.9 | 0.526 |

BP = blood pressure

Bold signifies significance

Total triage duration

The duration of the total triage process with the clown was shorter than without the clown (369 vs. 410 seconds $P = 0.089$) but the difference was significant only among male participants (334 vs. 396 seconds, $P = 0.046$) [Table 2]. As for the referral reason, of the children in the study group admitted to the PED due to trauma, the triage duration was about 50 seconds shorter compared to only 23 seconds shorter among the study group children who were referred for a reason other than trauma. No statistical differences were found between the two groups [Table 3]. The total triage time was shorter among Jewish children with the presence of medical clowns (353.6 ± 113 seconds vs. 419.8 ± 154 seconds in the control group, $P = 0.012$). This effect was not found in Arab children (370 ± 168.3 seconds vs. 445.7 ± 114.2 seconds, $P = 0.219$) [Table 3].

DISCUSSION

BP measurement is a routine procedure, frequently performed on every pediatric patient at admission to the PED. To the best of our knowledge, the current study is the first to investigate the ability of medical clowns to decrease the time required to obtain a BP measurement. Our results indicate that the distraction by a medical clown during assessment of vital signs significantly contributed to shortening BP measurement, and hence the entire triage process among certain pediatric populations.

Although the reduction in time required to obtain a BP measurement demonstrated in the current study might appear negligible in terms of a single visit duration (an average of 20 seconds for each patient), if multiplied by the number of visits in a 6-month study period with $19,318$ visits, this effect could have saved over 107 hours, thus having a significant cumulative effect.

Several factors are known to affect proper BP measurement, one of which is the child's anxiety. Although, participants' anxiety level in the current study was not evaluated, several previous studies demonstrated that distraction by medical clowns contributes to reducing the anxiety of children undergoing medical procedures, which consequently increased both parents' and children's satisfaction [13,14].

A study by Meiri and co-authors [15] performed in an Israeli PED showed that exposure to medical clowns during physical examination was able to reduce the child's discomfort without affecting the overall examination's duration.

Most studies investigate the effects of medical clowns on patient's anxiety level and pain score; however, little information is available on improving work efficiency in routine procedures such as assessment of the vital signs (heart rate, temperature, BP measurements) or blood drawing.

The current study was designed to examine the effects of medical clowns on work efficiency (mediated by shortening procedure time) and found that distraction by a medical clown in the triage led to a significant reduction in BP time.

Overall triage time was found to be shorter only among Jewish children. A previous study by Gilboa-Negari et al. [16] demonstrated an opposite effect on anxiety reduction among hospitalized pediatric patients undergoing invasive procedure. Arab Bedouin children were more affected than Jewish children; however, the overall procedure time was not addressed. Moreover, the investigators attributed their results to nonverbal methods in addition to the use of Arabic language by the medical clowns [16].

Medical clowns in the current study were Hebrew speakers. Although some of them knew a few words in Arabic, none spoke the language fluently; thus, contributing to the different results.

This finding raises the need to integrate multi-lingual-speaking medical clowns into the PED in institutions serving multi-national populations, such as ours.

In the current study, we demonstrated a different effect of medical clowns on BP measurement time and overall triage length among male vs. female participants. Gender differences have not been evaluated extensively in previous medical clown studies. Hansen and colleagues [17] found a beneficial effect of medical clowns during performing a venipuncture on female, who cried less and reacted better to repeated treatments, compared to the negative effects shown with males. The researchers did not suggest an explanation for these differences. Yet unlike our study, Hansen et al. focused on a single and often first-time encounter with a medical clown. They investigated the positive effect of repeated exposure to medical clowns during invasive procedures.

LIMITATIONS

This single-center study was conducted exclusively in the morning ED shifts, during medical clown's activity hours; hence, the results may not be indicative to a different medical institute or even to the same PED during different working hours.

Given the known effect of medical clowns in reducing anxiety and pain in hospitalized children, we expected similar results in the children participating in the current study. However, the effect of medical clowns on the anxiety level of the participants and their parents was not investigated.

Therefore, we are unable to determine whether the beneficial effect on shortening BP procedure was attributed to a decrease in patient anxiety.

CONCLUSIONS

The presence of a medical clown during triage shortens the time required to obtain accurate BP measurements in children presenting at the emergency department. The use of medical clowns might result in a significant improvement in the use of human resources in the PED, as well as in reducing children's anxiety and pain. The current study reinforces the need to integrate medical clowns into the PED. Considering the stronger positive effect of medical clowns among the Jewish children shown in our study, we suggest a need to inte-

grate of Arabic-speaking clowns in a culturally appropriate manner, especially in pediatric centers serving multi-ethnic populations.

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