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Impact of smartphone digital photography, email, and media communication on emergency room visits post-hypospadias repair

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Abstract

Introduction: Advances in communication technology are shaping our medical practice. To date, there is no clear evidence that this mode of communication will have any effect on unnecessary postoperative emergency room (ER) visits. We aim to evaluate the effect of email and media communication with application of smartphone digital photography on post-hypospadias repair ER visit rates.

Methods: This prospective cohort study included all patients who underwent hypospadias repair performed by a single surgeon from October 2014 to November 2015. Patients were categorized into two groups: Group A consented for smartphone photography and email communication and Group B declined. Reason for ER visits within 30 days postoperatively was assessed by another physician, who was blinded of patient group assignment. The reasons were categorized as: unnecessary ER visit, indicated ER visit, or visit unrelated to hypospadias surgery. Chi-square test and T-test were used for statistical analysis. Relative risk (RR) and corresponding 95% confidence interval (CI) were also calculated. Statistical significance was set at $p < 0.05$.

Results: Over a 14-month period, 96 patients underwent hypospadias repair (81 in Group A, 15 in Group B). No significant difference was noted between groups for overall ER return rate (RR 0.46, 95% CI 0.21, 1.0). However, the number of ER visits for wound check not requiring intervention was significantly lower in Group A than in Group B (RR 0.14, 95% CI 0.035, 0.56); likewise, a higher number of ER visits requiring intervention was noted in Group A compared with Group B, although statistically this was not significant (RR 1.67, 95% CI 0.23, 12.21).

Conclusions: Email communication with the use of smartphone digital photography significantly reduced the number of unnecessary ER visits for post-hypospadias wound checks.

Introduction

Hypospadias surgery has evolved from a procedure marked by a complex long postoperative admission to a routine day

surgery.^{1,2} At our institution, hypospadias repair is performed as a day surgery, with the majority of our patients sent home the same day, unless medically indicated. Postoperatively, they are seen in 7–10 days for penile stent removal and at three months for functional evaluation (stream flow and penile curvature) and assessment of the cosmetic results.³ Consequently, the majority of the recovery process is witnessed primarily by the patient's caregivers at home. Despite simplifications of the dressing, as well as efforts to provide support to the caregivers, penile surgery remains one of the most common pediatric urological procedures that leads to emergency room (ER) visits.^{3,4} One of the reasons for ER visits may due to the anxiety and uncertainty of caregivers on the postoperative wound appearance that would suggest infection or inadequate healing (discoloration or excessive swelling).⁴

Smartphones and the internet have become widely accessible commodities worldwide, making email a feasible method of communication between a patient's family and healthcare provider.^{5,6} A recent study by Turk et al showed that photos from caregivers' video cameras for the followup assessment of children post-hypospadias repair decrease hospital anxiety for children and reduce clinic time at followup visits.⁷ However, to date, there is no clear evidence that this mode of communication will have any effect on unnecessary postoperative ER visits.⁸ Our hypothesis is that use of email communication for close followup and documentation of postoperative healing would decrease unnecessary ER visits, specifically for wound checks, to rule out infections or inadequate healing.

Methods

This is a prospective cohort study and quality improvement project approved by the institutional quality management department. All consecutive patients who underwent hypospadias repair surgery by a single surgeon from October 2014 to November 2015 were included. The caregivers of all patients undergoing hypospadias repair were informed for inclusion in the project. Those who agreed to communicate

postoperatively with email and smartphone digital photography signed the standard hospital photography consent form, which allows the healthcare providers to use the photos for diagnosis and treatment, education, and/or publication. On the day of surgery, caregivers were instructed to take photos using their smartphones on postoperative days 1–7, 10, 14, 21, 28, 35, and 42 (Fig. 1) and email them to the urology clinic nurse. The email account was checked daily and regularly by our specialized and experienced urology nurses. Advice on the healing process was given in real time, while for urgent situations and conditions that required intervention, patients were advised to present to the ER immediately. The images were analyzed, organized, and saved on a secure hospital server. Caregivers were encouraged to communicate their concerns through email as well. All communications were saved in the patient's electronic medical record. Those who opted not to participate in the project and opted not to send in photographs were supported with standard postoperative communication. They were also encouraged to email or call the urology clinic nurse for any questions or concerns. Both groups were given a postoperative care sheet that described pain medication usage and expected surgical dressing care with some images of the common healing process (expected edema, colour change, and stent appearance).

Patients were categorized into two groups: Group A included those who consented for email communication and photography, while Group B consisted of those who declined. Baseline characteristics, such as age, hypospadias

classification, comorbidities, and surgery type between those who declined and consented were collected and compared. Prospective data collection of the 30-day post-hypospadias repair ER visits was done by another physician, who was not aware of the patient assignment and objectively evaluated the reason for each visit according to ER records on chief complaint, ER management, and discharge instructions. The reasons for ER visits were categorized as: non-indicated ER visit, such as postoperative wound check requiring no intervention; indicated ER visit, such as patients with postoperative bleeding or catheter-related issues requiring intervention; or non-surgery-related visit, such as upper respiratory tract infection, viral infection, and other medical conditions. Baseline nominal data was analyzed using Chi-square test, while continuous data was analyzed using T-test. Statistical significance was set as $p < 0.05$. Relative risk (RR), absolute risk reduction, and number needed to treat were calculated for all-cause ER return and unnecessary ER visits. Microsoft Windows Excel program 2010 was used for data encoding, while statistical analysis was carried out using statistical software IBM-SPSS v20.

Results

Over a 14-month period, a total of 96 patients underwent hypospadias repair, of which, 81 caregivers agreed to participate and 15 declined. For the purposes of inclusion in data analysis, we considered a complete photo set to include at least six of the 13 images requested to be emailed. A significant difference in inclusion rates between the groups was noted related to the age of the patient; caregivers of older patients declined to participate when compared to those who consented (Group A median 11 months [interquartile range 9–17] vs. Group B median 15 months [interquartile range 9–23], respectively; $p < 0.001$). There was no significant difference in terms of comorbidities, concomitant inguinal surgery, hypospadias classification, and type of hypospadias repair (Table 1).

Table 2 summarizes the number of patients brought in for ER visits and the corresponding reasons. Although there was a high proportion of Group B patients who returned to the ER, there was no significant statistical difference between the two groups (A: 15 [18.5%] vs. B: 6 [40%]; $p = 0.05$). RR for all cause ER

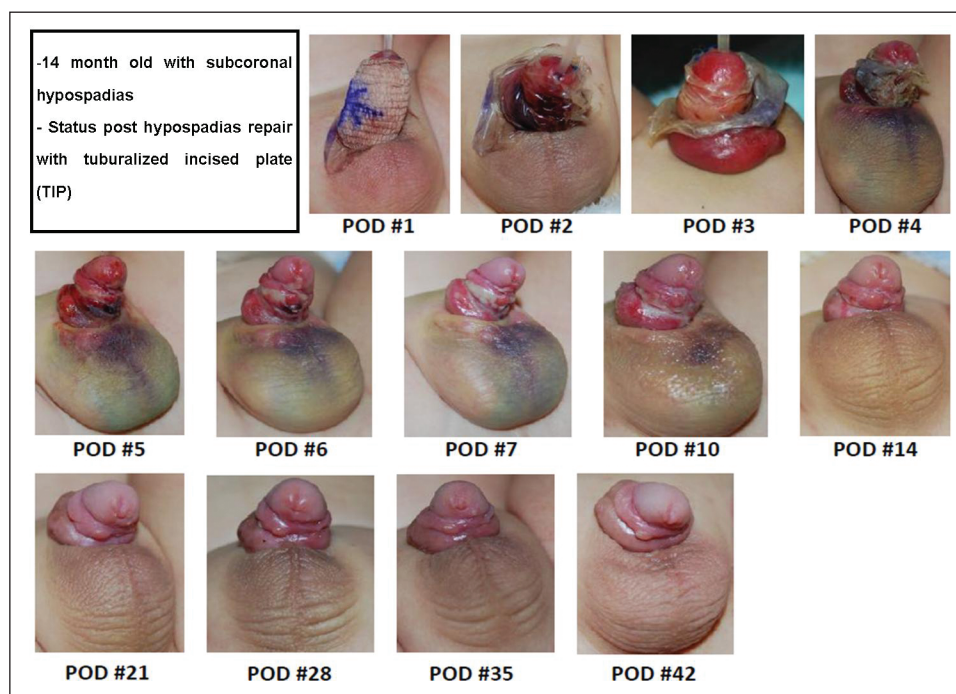


Fig. 1. Sample smartphone photography image sent by the patient's caregivers via email communication to urology nurse for evaluation.

Table 1. Summary of baseline characteristics of study groups

	Group A – Consented	Group B – Declined	p
Number of patients	81	15	
Average pictures sent, n (%)	7	0	
≥2	60 (74)	-	
≥6	46 (57)	-	
≥10	34 (42)	-	
Age in months, mean (SD)	16.3 (15.4)	32 (46.4)	<0.001
Comorbidities, n (%)			
None	76 (93.8)	13 (86.7)	0.33
Yes	5 (6.2)	2 (13.3)	
Concomitant inguinal surgery, n (%)			
No	78 (96.3)	14 (93.3)	0.6
Yes	3 (3.7)	1 (6.7)	
Hypospadias classification, n (%)			
Distal	47 (58)	13 (86.7)	0.09
Midshaft	13 (16)	0 (0)	
Proximal	21 (26)	2 (13.3)	
Hypospadias repair type, n (%)			
Single-stage	62 (76.5)	14 (93.3)	0.26
First-stage	12 (14.8)	0 (0)	
Second-stage	7 (8.6)	1 (6.7)	

visit was 0.46 (95% confidence interval [CI] 0.21–1.00) with absolute risk reduction of 21.5% and number needed to treat of 5. On further analysis of the reason for ER consult, a statistically significant difference was noted for wound check evaluation (A: 3 [4%] vs. B: 4 [27%]; $p=0.005$), RR of 0.14 (95% CI 0.035–0.56), absolute risk reduction of 23%, and number needed to treat of 4. No significant difference was found for ER non-surgical visits and surgically indicated visits, with RR of 0.28 (95% CI 0.051–1.52) and 1.67 (95% CI 0.23–12.21) in Groups A and B, respectively. However, we found a slightly increased number of surgically indicated visits among those in Group A compared to Group B. Although there was no significant difference between the groups in the interval of time from postoperative day to initial ER consultation, a trend toward earlier postoperative day emergency consult was noted among those who consented.

Discussion

Hypospadias repair is a common elective operation in pediatric urology, with a relatively straightforward postoperative course. It therefore provides an excellent scenario to evaluate the use of postoperative smartphone photography and email communication. The use of digitally acquired images for the evaluation of post-hypospadias repairs has been shown to be an effective and objective way to evaluate cosmetic outcomes.⁹ Likewise, a surgical atlas for penile surgery used as an educational resource has been described to decrease postoperative telephone calls.¹⁰ Our study further applied the widely used and accessible smartphone for caregivers to email postoperative photos to the healthcare team. The feasibility of this mode of communication has been previously studied;^{5–8} however, there has been no evidence to show that this communication is effective in educating caregivers regarding wound-healing or providing insight on when to return to the clinic or ER for evaluation. To our knowledge, this study is the first to demonstrate the effect of email communication and smartphone photography on aftercare, specifically unnecessary ER return rates among patients having undergone hypospadias repair.

This cohort study intended to include all consecutive patients for hypospadias repair and not to control any variables or stratify the patients between groups. With this study method, we can observe the pragmatic outcome and analyze the characteristics of patients/families that consented and declined the proposed mode of communication for postoperative care. Among all patients who underwent hypospadias repair surgery, the majority of caregivers opted to be included in the study. However, our results show that caregivers of older patients had a higher tendency to decline sending postoperative pictures and email communication. Not opting to participate could be due to lack of comfort with the communication, language barrier, or a lack of technical savvy among parents of older patients. We speculate that this may be due to the perceived added difficulty in obtaining images from these patients and possible privacy concerns that older patients may have. The willingness to consent for email communication and smartphone photography was not affected by patient comorbidities, severity of the hypospadias, or type of surgical repair.

With the increased availability and rapid response capability of email communication, there can be better corre-

Table 2. Emergency room return of study groups

	Group A – Consented	Group B – Declined	p	Relative risk (95% CI)
Return for consult, n (%)	15 (18.5)	6 (40)	0.05	0.46 (0.21–1.0)
Return reason, n (%)				
Wound check	3 (4)	4 (27)	0.01	0.14 (0.035–0.56)
Non-related/medical reason	3 (4)	2 (13)	0.17	0.28 (0.05–1.52)
Indicated (excessive bleeding/ catheter issues)	9 (11)	1 (7)	0.62	1.67 (0.23–12.21)
Postoperative day return, mean (SD)	3.4 (1.25)	8.17 (2.87)	0.14	

CI: confidence interval; SD: standard deviation.

spondence from the nursing team or other members of the healthcare team (such as fellows and associates) in providing medical advice to the caregivers. The results of our study also emphasized the involvement of nursing care in the setting of day surgery for hypospadias repair, which is likewise important.¹¹ When caregivers have an avenue to communicate with a urology nurse and the medical team, this can increase their understanding and confidence, and provide the reassurance needed to hopefully avoid unnecessary ER visits for wound checks. This was clearly shown in our study, with a significantly fewer Group A patients being brought back to the ER for wound evaluation with no interventions needed. Similarly, based on the provided photos, caregivers could be advised by the correspondent to return earlier for surgically indicated ER visits, possibly preventing further complications. A similar concept was mentioned by Arlen et al, who stated that additional educational resources may also serve to alert caregivers to signs and symptoms that warrant prompt intervention (e.g., bleeding that requires intervention or infections that need additional assessment).⁴

Stalberg et al evaluated the use of email communications initiated by the patient in the perioperative time period for elective thyroid surgery.¹² They noted improved communication between patient and surgeon with no apparent decrease in measured satisfaction. Potential drawbacks discussed include inability to examine the patient, threat to patient privacy, and medico-legal issues. While our study presents many positive findings with regard to email communications with smartphone digital photography, we must always be mindful of the potential repercussions related to patient privacy and the lack of ability to physically evaluate the patient.

One additional advantage of our study was that it allowed us to collect images that depict the normal healing process of post-hypospadias repair surgery. This has enabled us to organize a complete atlas of images of hypospadias surgery to provide an additional educational resource to families. This study has the limitation of being a non-randomized, prospective study, where performance and attrition bias could be present. However, as discussed, we intended to assess the pragmatic situation in implementing this new concept and analyze variables that would lead patients to decline such mode of postoperative communication. Likewise, we made effort to control attrition bias by having a separate physician, who was blinded of patient assignment, to assess the reason for the postoperative ER visit. It is an acknowledged limitation of this study that we were not able to acquire demographic details about the families or the parents. But given that we were able to identify patient variables and other possible reasons that would likely lead to declining e-communication, we recommend a prospective, controlled trial enrolling guardians who are tech-savvy and of similar age group with patients randomly assigned to two arms — one that is asked to use their smartphone to acquire pictures and one that is asked not to use smartphone and to just use the traditional phone

contact or email method. This would correct for the potential selection bias issue and validate our findings.

Conclusion

Our study demonstrates that the use of smartphone digital photography and email communication reduces the number of unnecessary ER visits among post-hypospadias repair patients. We propose that this mode of communication should be considered as part of routine postoperative care management. We have changed our practice to include the option to send postoperative photographs via email communication to all our hypospadias patients. We hope that this will help to facilitate fast and effective communication with the patients and their families to ensure quality postoperative care and outcomes.

Competing interests: Dr. Dos Santos has received honoraria from Duchesnay. The remaining authors report no competing personal or financial interests.

This paper has been peer-reviewed.

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