

ASHOKA: An Artificial Intelligence-based Detection and Management System for Hypospadias in Indonesia

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BACKGROUND

HYPOSPADIA MADE APRILLIO A WOMAN

Who is he?



Army 2nd Sergeant



Female Volleyball Athlete



Being a woman for 20 plus years





FACTS



Hypospadias

Hypospadias is a common congenital condition affecting boys, with a prevalence rate of 1 case per 300 births.

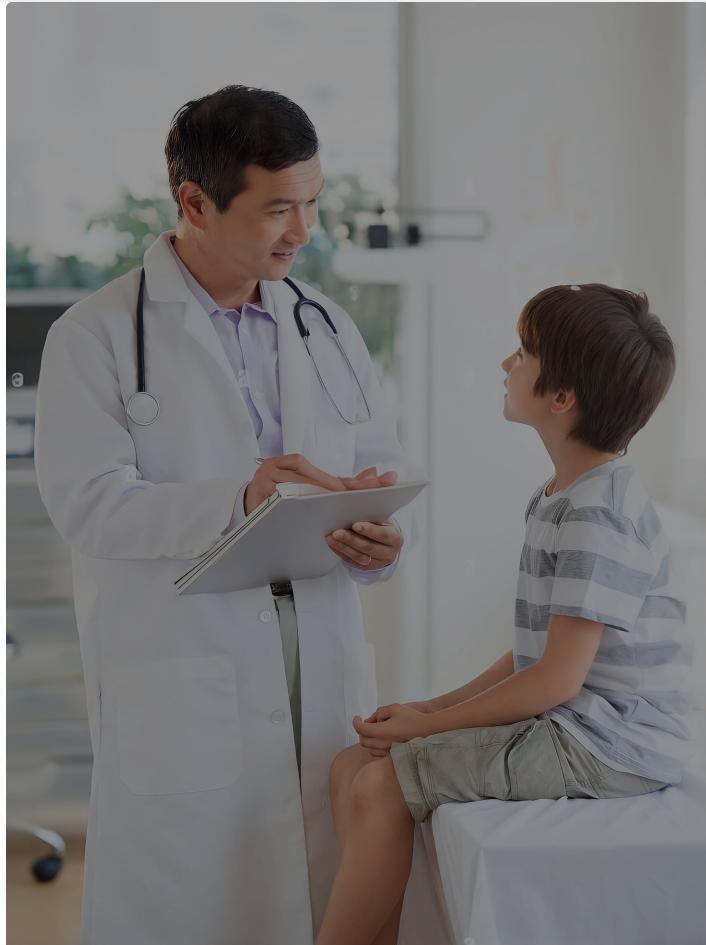
pubmed.ncbi.nlm.nih.gov

FACTS



**"Limited availability of urologists
and infrastructure interrupting the
diagnosis and management of
hypospadias in Indonesia."**

iaui.or.id





RELATED WORK

User-centered development of a hypospadias decision aid prototype

Katherine H. Chan^{a b c}  , **Rosalia Misseri**^a , **Aaron Carroll**^b , **Richard Frankel**^{c d} ,
Courtney M. Moore^f , **Brandon Cockrum**^f , **Sarah E. Wiehe**^{e f} 

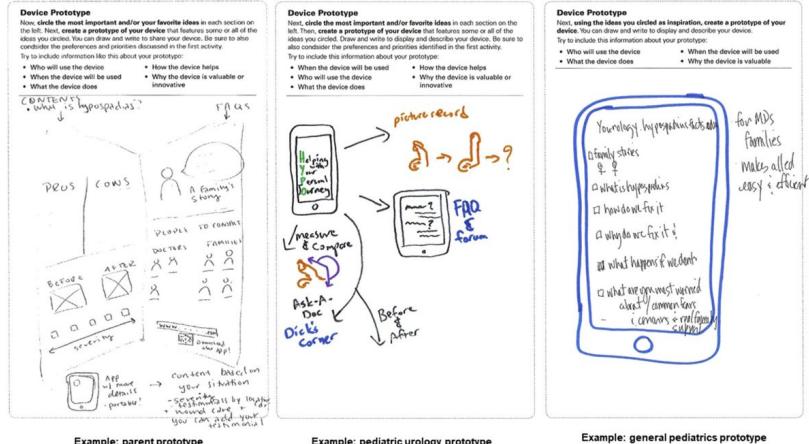


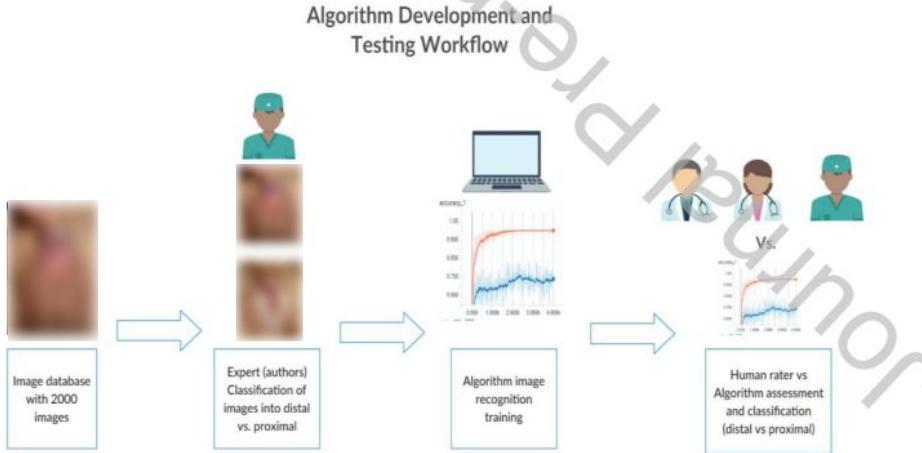
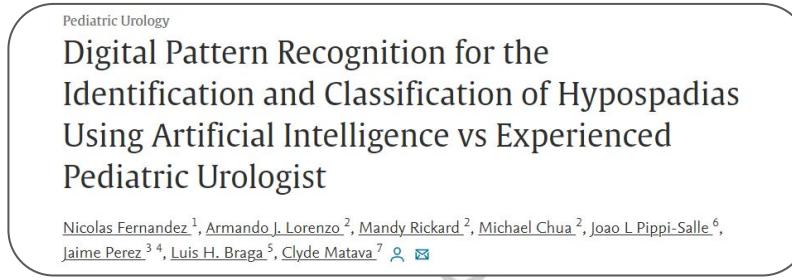
Figure 1 Examples of hypospadias decision aid prototypes created by parents, pediatric urology and general pediatric providers respectively during three co-design workshops.

Hypospadias Shared-Decision Making Tool				
Users	Environments & Timing of Use	Form	Features	Hypospadias Education
Parents	Home Before and After Consult	App	Hypospadias Education	General Info
Patients	Doctor's Office	Website	Figures, Imagery & 3D Models	Repair
Doctors	Anytime Using Internet	Printed Materials	Testimonials	Post-Op Care & Recovery
Former Patients	Childcare Adverse Caregivers	Videos	Connect People	Accurate & Reliable
Caregivers	Telemedicine Consult	Anatomical Model	Facilitate Family Discussion	Reference Charts & Statistics
	Provider Training		Decision Making Activity	Expert Stories & Advice
	Newborn Nursery		Applies Multiple Learning Styles	Before & After Imagery
			Customizable to Patient	Pros, Cons & FAQ
			Chordae Measurement Tool	Long-term Outcomes Repaired or Not
			Interactive	Repair Complication

Figure 2. Summary of the key features and requirements of the hypospadias decision aid recommended by parents and providers

RELATED WORK

Figure 1. Algorithm creation and testing workflow



RELATED WORK

User-centered development of a hypospadias decision aid prototype

Katherine H. Chan ^{a b c}   , Rosalia Misseri ^a  , Aaron Carroll ^b  , Richard Frankel ^{c d}  , Courtney M. Moore ^f  , Brandon Cockrum ^f  , Sarah E. Wiehe ^{e f} 

Pediatric Urology

Digital Pattern Recognition for the Identification and Classification of Hypospadias Using Artificial Intelligence vs Experienced Pediatric Urologist

Nicolas Fernandez ¹, Armando J. Lorenzo ², Mandy Rickard ², Michael Chua ², Joao L Pippi-Salle ⁶, Jaime Perez ^{3 4}, Luis H. Braga ⁵, Clyde Matava ⁷  

Missing Point

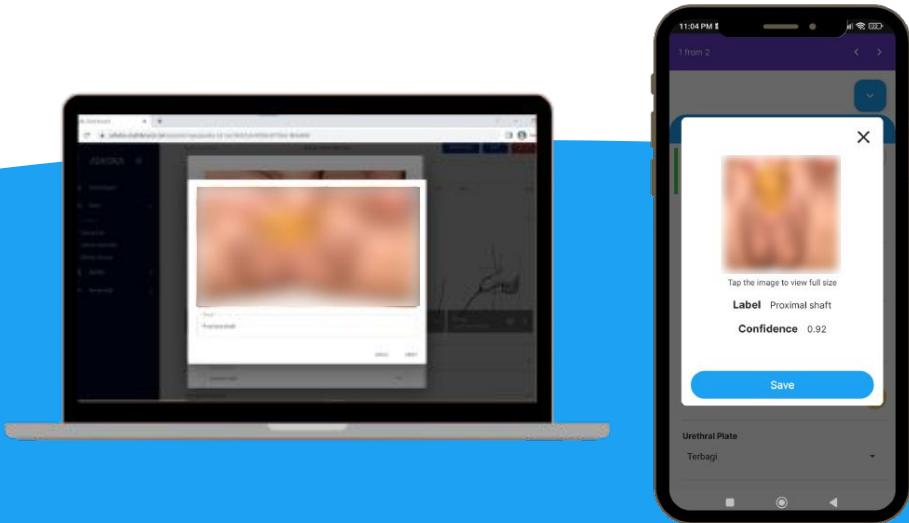
Nothing has reached the end-to-end stage yet.

PROPOSED METHOD

ASHOKA

Alat Skrining Kesehatan Organ Kelamin Anak (A Screening Tool Of the Child's Genital Organs)

ASHOKA is the First Mobile Application in Indonesia designed to assist urology doctors in early screening of patients with hypospadias.



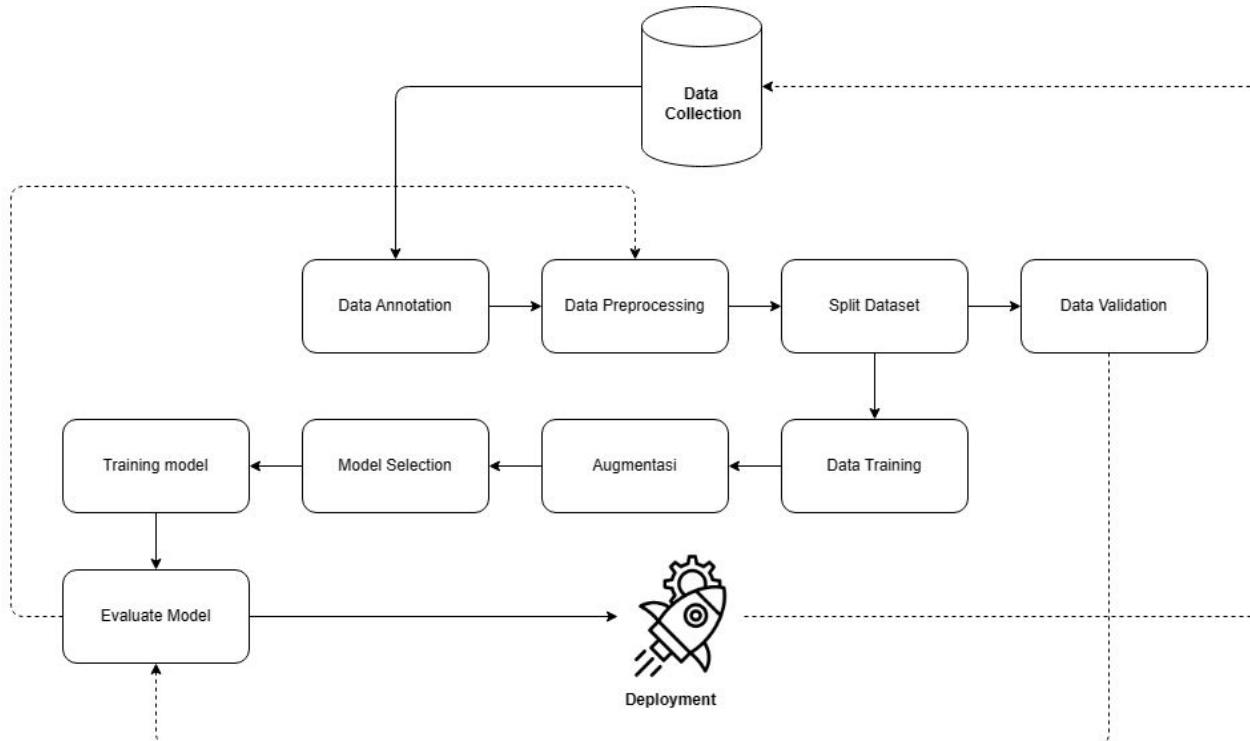
COLLABORATOR

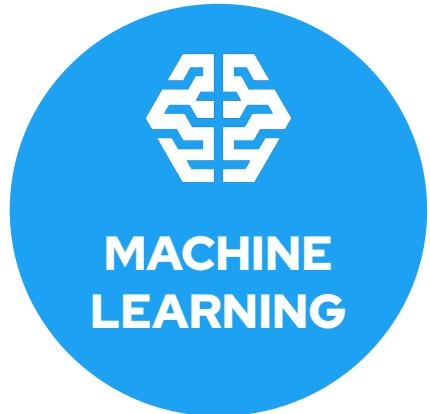


Dr. Cipto Mangunkusumo National Central Public Hospital

(Rumah Sakit Cipto Mangunkusumo)

FLOW MACHINE LEARNING MODEL





Building model
to detect
location of
meatus

YOLOv5 Algorithm

- YOLOv5n-seg
- YOLOv5s-seg
- YOLOv5m-seg
- YOLOv5l-seg
- YOLOv5x-seg





RESULT & EVALUATION

Data Training YOLOv5n-seg

	Image	Box (Precision)	Box (Recall)	Box (mAP50)	Box (mAP50-95)	Mask (Precision)	Mask (Recall)	Mask (mAP50)	Mask (mAP50-95)
all	261	0.998	1	0.995	0.916	0.998	1	0.995	0.903
Distal	60	0.998	1	0.995	0.906	0.998	1	0.995	0.883
Glanular	51	0.997	1	0.995	0.924	0.997	1	0.995	0.913
Perineal	60	0.999	1	0.995	0.92	0.999	1	0.995	0.909
Proksimal shaft	90	0.999	1	0.995	0.914	0.999	1	0.995	0.905

Table Confusion Matrix Data Training

EXPERIMENT RESULT



Data Validation YOLOv5n-seg

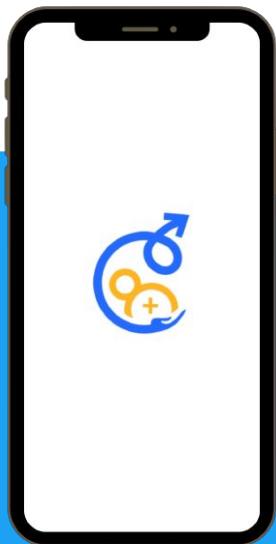
	Image	Box (Precision)	Box (Recall)	Box (mAP50)	Box (mAP50-95)	Mask (Precision)	Mask (Recall)	Mask (mAP50)	Mask (mAP50-95)
all	22	0.633	0.565	0.579	0.333	0.593	0.53	0.549	0.339
Distal	6	0.955	0.333	0.614	0.196	0.951	0.333	0.614	0.243
Glanular	5	0.665	1	0.831	0.591	0.664	1	0.831	0.609
Perineal	4	0.451	0.5	0.497	0.367	0.45	0.5	0.497	0.334
Proksimal shaft	7	0.461	0.429	0.375	0.179	0.307	0.286	0.253	0.167

Table Confusion Matrix Data Validation

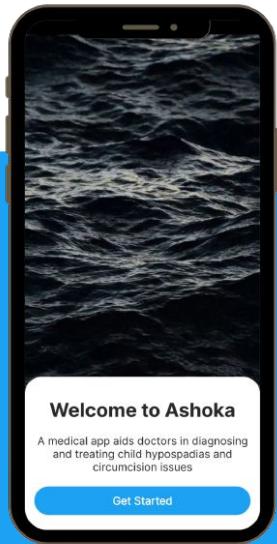
APP SCREENSHOTS



Splash



App Intro



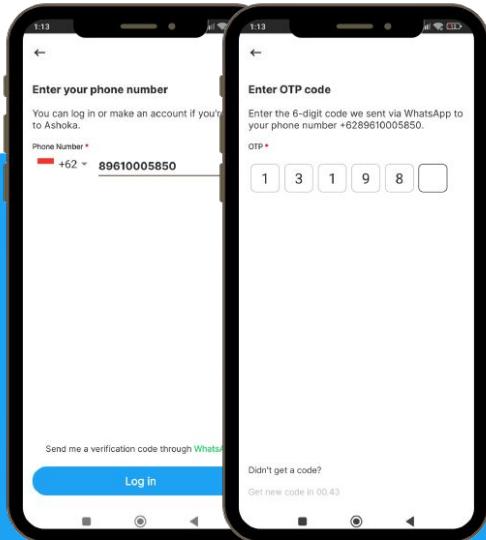
Sign Onboarding



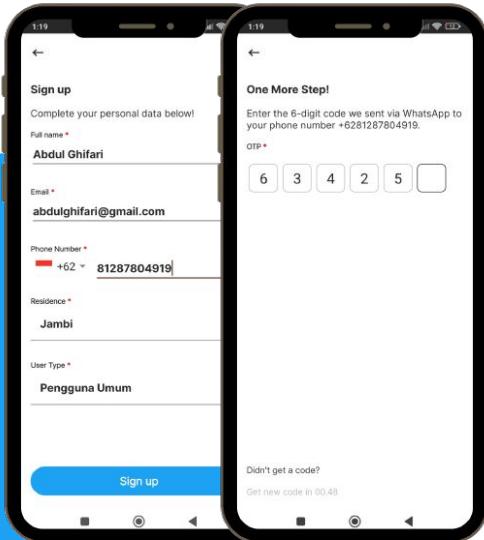
APP SCREENSHOTS



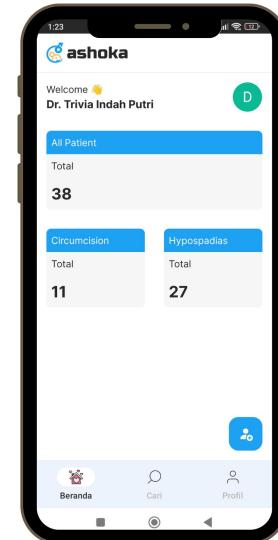
Sign In



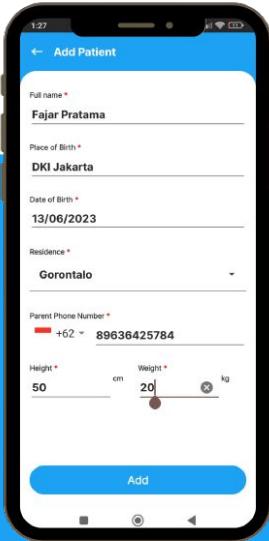
Sign Up



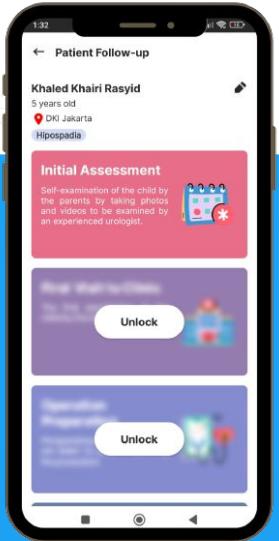
Home Page



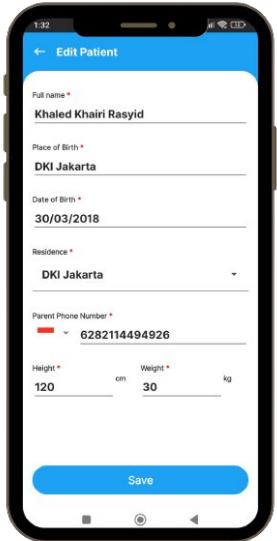
Add Patient



Patient Details



Edit Patient



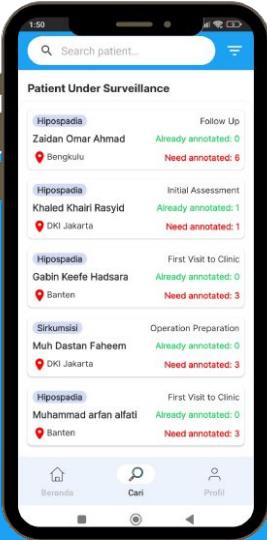
Detail Assessment



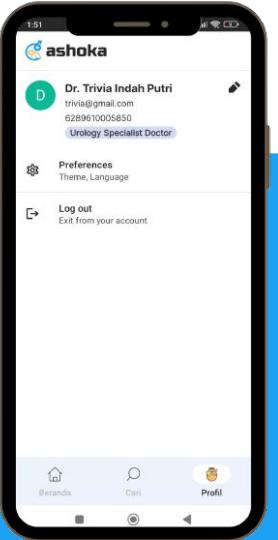
APP SCREENSHOTS



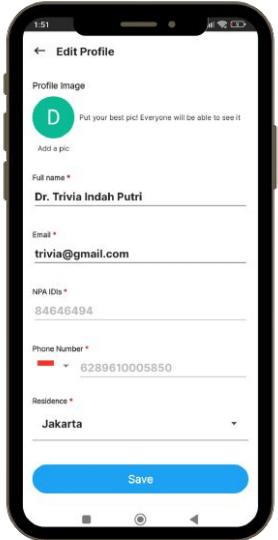
Search Page



Profile Page



Edit Profile



Preferences



APP SCREENSHOTS



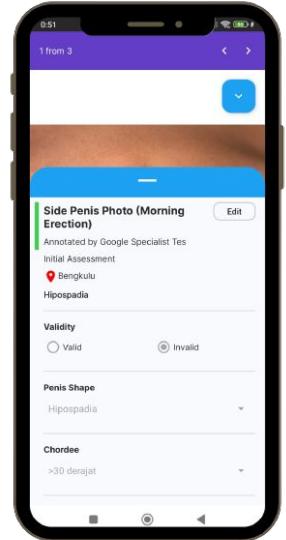
Take Photo & Video



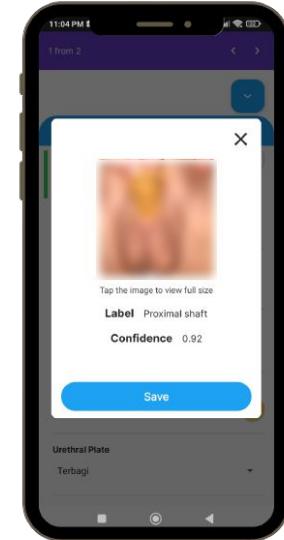
Image Adjustment



View Photo & Video

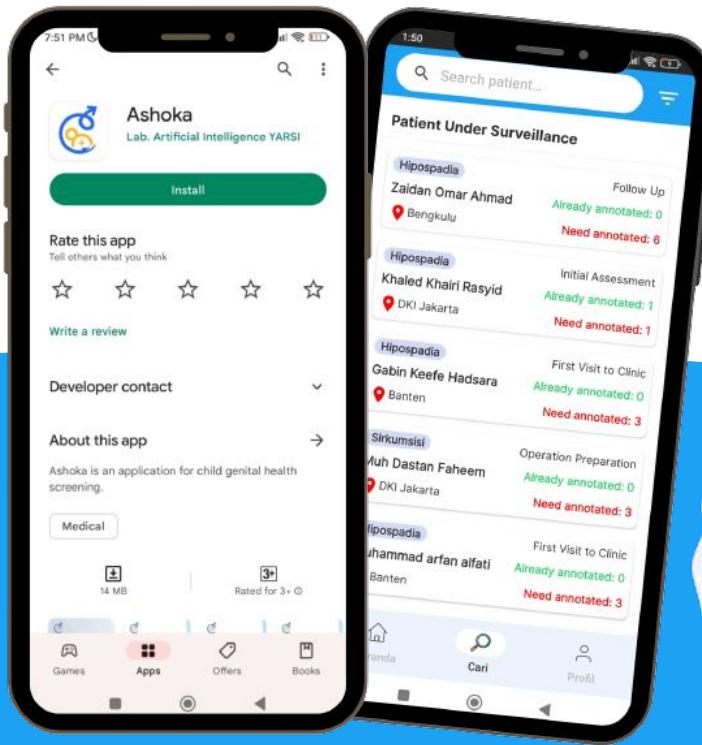


AI Predict



AVAILABILITY

Expert-approved
and trusted.



CONCLUSION & FUTURE WORK

Expectation for Society:



The Ashoka application enables the community to easily report symptoms or health conditions.



Reducing the cost and time required for direct visits to hospitals.



Improving access to healthcare services for remote communities or individuals with physical limitations.

Expectation for Doctors:



Accessing and efficiently evaluating patient health information.



Making more accurate assessments and timely medical decisions.



Tracking patient health history more effectively.

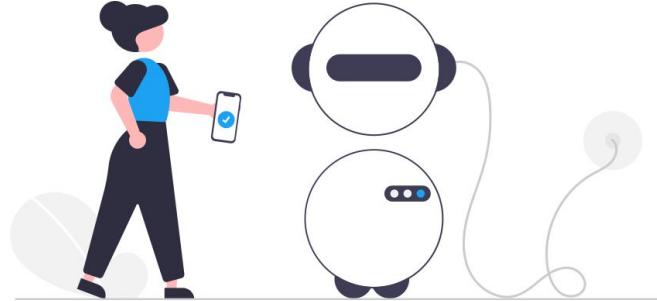


Facilitating appropriate supervision and follow-up actions.

FUTURE WORK



Developing a better model to improve accuracy in detecting the location of the meatus.



Developing a more intuitive and responsive user interface to enhance the user experience and minimize the training time required for new users.

ACKNOWLEDGMENT



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**Dr. Cipto Mangunkusumo National
Central Public Hospital**

(Rumah Sakit Cipto Mangunkusumo)



ASHOKA

Alat Skrining Kesehatan Organ Kelamin Anak

(A Screening Tool Of the Child's Genital Organs)

Examining, Monitoring, and
Detecting Hypospadias

