



Singapore Healthcare Management 2025

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From Paper to Pixels: Greening the Referral Process

The management of Outpatient referrals at TTSH Specialist Outpatient Clinics (SOCs) faced significant operational challenges before implementing In-basket triaging within the Next Generation Electronic Medical Records (NGEMR) system. Patient Service Associates (PSAs) in SOCs relied on a labour-intensive, paper-based workflow that consumed substantial time and resources. This involved multiple time-consuming steps as PSAs printed each referral document, physically sorted according to speciality and urgency, created paper files for doctors' triaging before retrieving them to schedule appointments. Key issues included resource inefficiency, wastage, misplaced referrals, delay in access to patient care and appointment scheduling, of which were ultimately magnified during peak periods when high volumes of referrals required processing.

These challenges highlighted an urgent need for a digital workflow transformation within the SOC. Following several clinic engagements and staff trainings, 21 out of 26 SOC have successfully transitioned into the In-basket triaging system. A post-implementation user survey celebrated a reduction in operational inefficiencies and enhanced patient care by enabling faster appointment scheduling. Therefore, "Paper to Pixels" in TTSH aligns with Singapore's Green Plan 2030 through the digitisation of referrals via NGEMR. By streamlining communications between clinic staff, In-basket triaging has improved access to patient care, resource efficiency and staff satisfaction. A comparative analysis between 2019 (pre-digital) and 2024 (post-implementation) demonstrates significant improvements.

Problem Statement

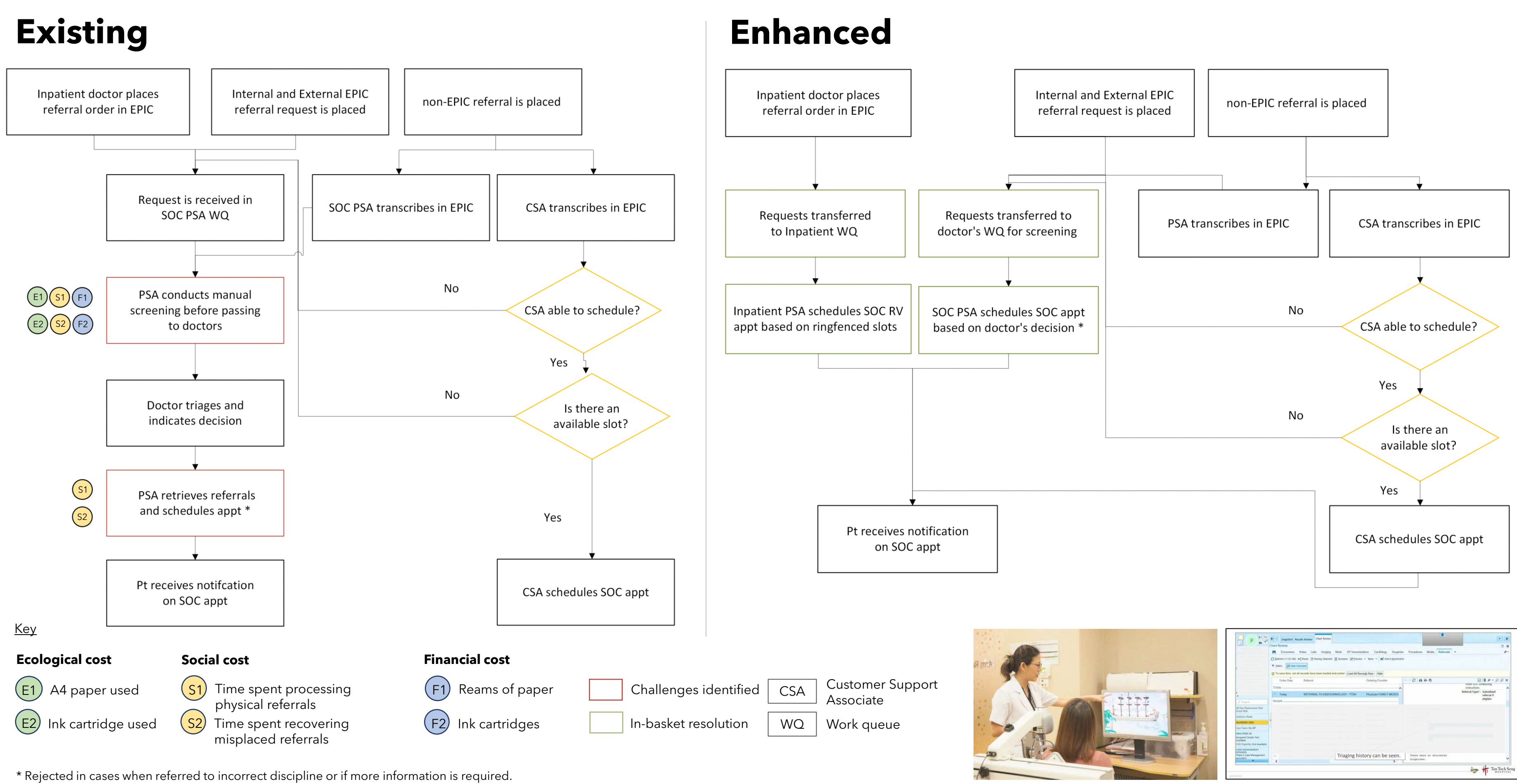
The laborious practice of physically passing printed referrals to doctors for triaging in SOC consumes excessive paper resources and operational hours while creating unnecessary processing delays that impede timely patient appointments.



Objective

To transform the labourious referral triaging process into a streamlined digital workflow that enhances clinical efficiency and reduces environmental impact, while accelerating patient access to specialist care.

Operational Workflows



Implementation and Outcome

Regular engagements with SOC teams helped identify current challenges and gather feedback, driving organisational change and ensuring a smooth transition. With clinicians' buy-in, paper referrals were systematically replaced by In-basket triaging in 21 out of 26 (estimated 80%) of TTSH SOC.

Transition work started in 2022 with clinic managers and IT teams collaborating to optimise digital workflows. Staff underwent structured training to support this shift. The implementation was monitored through 2023-2024, with clinic managers providing usage data. The following average **annual savings** reflect positive progress towards the desired future state -

21 SOC (total 10,043 monthly appts for triaging ¹)					
	Success indicators	Pre-implementation; One month before rollout	Post-implementation; Rolled out across SOC progressively	Monthly savings	Annual savings Extrapolated to 1 year
Environmental cost	Paper used	40 reams	3 reams Used for staff training purposes	37 reams	444 reams
	Ink cartridge used ²	1.78 cartridges	0.13 cartridge	1.65 cartridges	19.8 cartridges
	CO ₂ e emitted ³ Paper and ink cartridge	3.08 kg CO ₂ e /ream 10.21kg CO ₂ e /cartridge	N/A	N/A	1,569.68 kg CO₂e (3.08 x 444) + (10.21 x 19.8)
Financial cost	Paper ² \$3.32/ ream	\$132.80	\$9.96	\$122.84	\$1,474.08
	Ink \$313.60/ cartridge	\$558.208	\$40.768	\$517.44	\$6, 209.28
Governance	Appt scheduling	Printed and filed hardcopy referrals	Digitally tracked in NGEMR	N/A	N/A
1 Speciality; Gastroenterology & Hepatology (784 average monthly appts for triaging)					
Social	Manhours taken For PSAs to schedule appt	8 min/ referral	5 min/ referral	3 min/ referral	N/A
	Average TAT ⁴	5 calendar days/ appt	4 calendar days/ appt	1 calendar day/ appt	N/A

¹ Appointments in October 2024. This number reflects only referrals from Intra-SOCs.
² Based on JK Copy Paper (A4, 80 GSM) and cartridge model HP W1470YC. Based on latest outpatient observations, 1 ink cartridge can yield 11,300 pages of A4 prints.
³ Information extracted from ChatGPT. Prompts used (1) What would be the CO₂e per ream of this paper purchased from Indonesia to Singapore. (2) What would be the CO₂e for one HP LaserJet W1470YC black toner cartridge manufactured in China and shipped to Singapore?
⁴ Information based on 95th percentile of Gastroenterology & Hepatology.

User Survey Responses

Response count = 176

The In-Basket Triaging has **significantly reduced the time** spent on the appointment booking process.

Strongly Agreed = 35%
Agreed = 50%
Disagreed = 12%
Strongly Disagreed = 3%

85%
SA and A

The implementation of In-Basket Triaging has substantially **reduced my department's reliance on utilizing hard-copy papers** for referral triaging.

Strongly Agreed = 45%
Agreed = 45%
Disagreed = 8%
Strongly Disagreed = 2%

90%
SA and A

The In-Basket Triaging is **intuitive** and **aligns well** with my department's existing referral triaging workflow.

Strongly Agreed = 35%
Agreed = 50%
Disagreed = 12%
Strongly Disagreed = 3%

85%
SA and A

The In-Basket Triaging has **improved communications** between clinical and administrative staff regarding referral management.

Strongly Agreed = 30%
Agreed = 45%
Disagreed = 20%
Strongly Disagreed = 5%

75%
SA and A

'No screening on day of clinic meant more **efficient running of clinic sessions**.'

Doctor

'**Cost savings** (lesser use of papers for hardcopy printing), **reduced risks of unintentional PDPA breaches** (e.g. probable misplacement of referrals), **enhanced productivity** (e.g. no longer spending time to look/ retrieve hardcopies from clinicians and time spent to print referrals), etc.'

Clinic Manager

'Improves **workflow efficiency**. Supports **team-based care, audit and accountability**.'

Patient Service Associate

1. Paper usage was reduced by **444 reams**, resulting in **\$1, 474.08 cost savings**.
2. **1, 596.68 kg CO₂e avoided** through reduced printing.
3. **Appointment scheduling time reduced by 1 day**, with the enhanced triaging accessibility via NGEMR.

Future state

TTSH is committed to achieving full adoption of In-basket triaging within the NGEMR system. Our "From Paper to Pixels" initiative showcases how **digital transformation** can deliver a multi-faceted benefits - enhancing patient care, improving staff efficiency and supporting environmental sustainability. As SOC also manage referrals from Inpatient settings, these gains can be further extended by incorporating Inpatient referrals into the digital workflow. By eliminating 444 reams of paper annually, we are building a more responsive healthcare system that contributes to Singapore's green future.