

Does Subcutaneous Administration Improve Patient Experience and Healthcare Capacity in HER2+ Breast Cancer

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Outline

**Impact of Subcutaneous Anti-Cancer Therapy
on Patients and the Healthcare System**

NCIS-on-the-Go Program

- *An innovative model of care to deliver low-risk anti-cancer therapy in the community*
- *Applicable for subcutaneous cancer treatments*

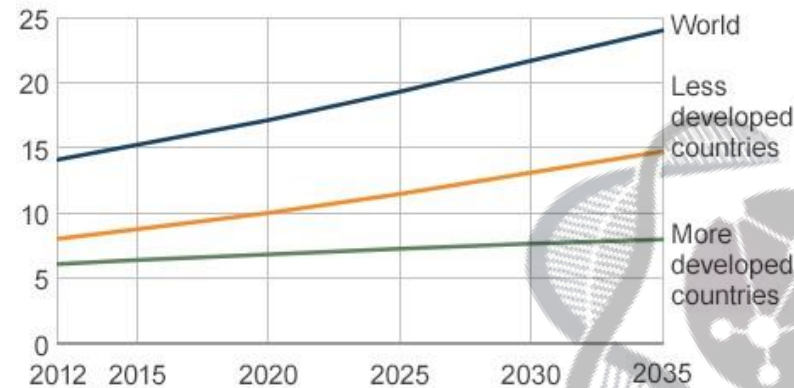
Increasing Demand for Cancer Treatment is increasing the Burden of Cancer Centres Globally

Global cancer burden is increasing

- Actual increase in incidence of some cancers
- **Ageing population**

Predicted global cancer cases

Cases (millions)



Source: WHO GloboCan

Many new classes of anti-cancer therapies have been developed, widening the treatment repertoire of cancer patients

Cancer patients are living longer, and receiving more lines of therapies

More healthcare resources are required to meet this increasing demand

Possible Solutions to Meet Increasing Demand in Cancer Treatment

Build more hospitals; expand hospital outpatient cancer treatment facilities

- Need capital investment; takes time

Simplify cancer treatment to facilitate **decentralized care** from hospital to the community

- Oral therapy
- Shorter intravenous infusions
- **Subcutaneous or intramuscular administration** instead of intravenous treatments

Advantages of Subcutaneous Formulations

Intravenous cannulation not required

Easy and quick to administer

Can be safely given outside the hospital setting

Main limitations

Volume of drug that can be administered; **typically no more than 1ml**

Not many anti-cancer drugs can be packaged into such small volume to be administered subcutaneously

Recombinant human hyaluronidase PH20 (rHuPH20)

Facilitating Large Volume Subcutaneous Infusions

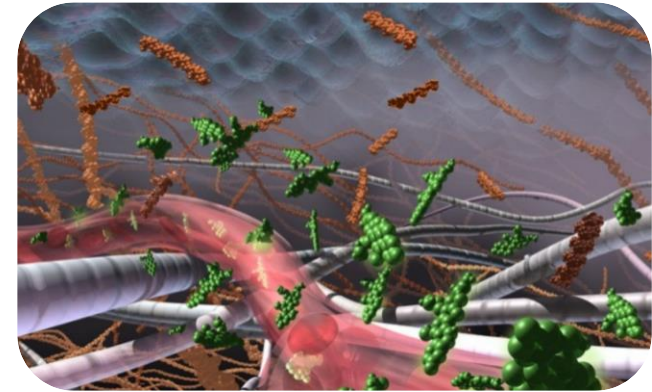
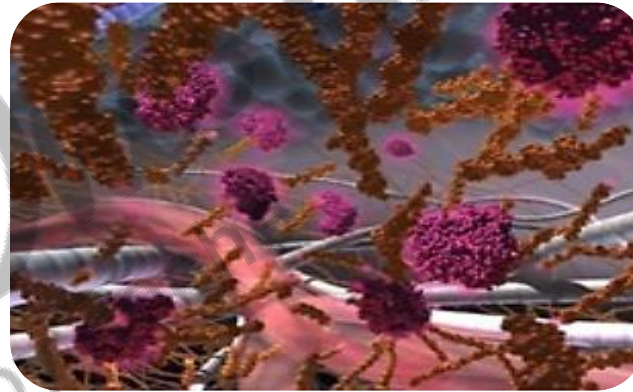
Fully human recombinant DNA-derived hyaluronidase enzyme

Novel drug delivery enzyme

Locally degrades hyaluronan and transiently increases bulk fluid flow

Pre-infusion of rHuPH20 **facilitates fluid dispersion**

Improves subcutaneous absorption profiles of co-administered agents



1

rHuPH20 Facilitates Larger Volume (>1ml) Subcutaneous Injections

Subcutaneous Injection of 10mL 10% IgG

Without rHuPH20

Before
injection



After
injection



With 2000 U/mL rHuPH20

Before
injection

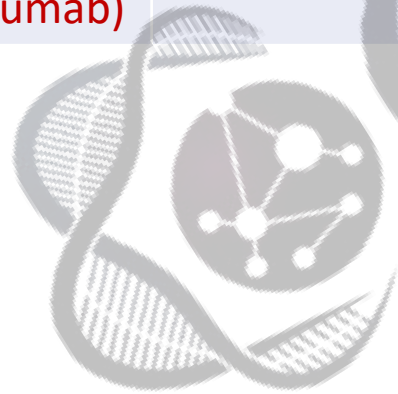


After
injection



Subcutaneous Monoclonal Antibodies approved by the US FDA to treat Solid Tumors

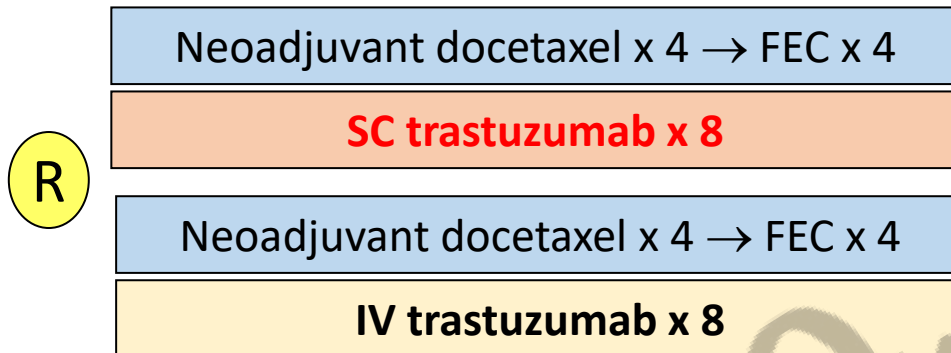
Product	FDA approval date	Hyaluronidase used	Injection volume and duration
Herceptin Hylecta (SC trastuzumab)	Feb 2019	Recombinant human hyaluronidase (rHuPH20)	5ml over 3-5 minutes, q3w
PHESGO (SC pertuzumab + trastuzumab)	June 2020	rHuPH20	Loading dose 15ml over 8 minutes Maintenance dose 10ml over 5 minutes , q3w



by Roche

HER2 Monoclonal Antibodies: *Subcutaneous vs Intravenous*

HannaH Trial; Phase 3 randomized,
Non-inferiority; N=299 HER2+ EBC



SC vs IV Trastuzumab

Similar PK, pCR rate, 6Y EFS/OS

Patient Preference Study

PrefHER Study (n=124 HER2+ EBC)

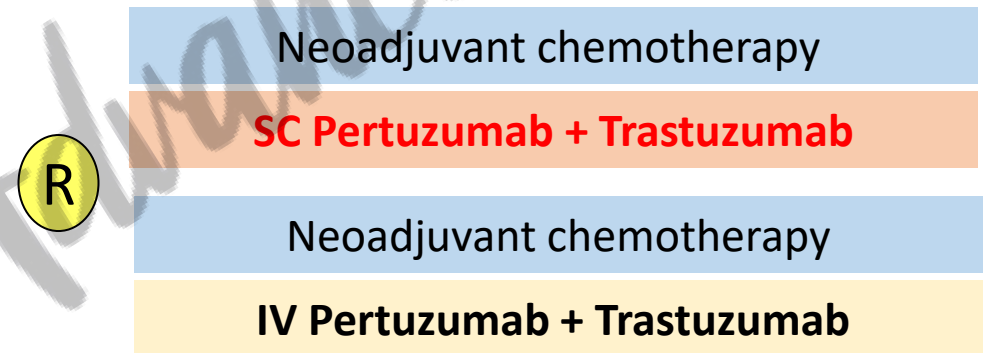
91.5% preferred SC

6.8% preferred IV

1.7% no preference

AE rates similar between SC and IV

FeDeriCa Trial; Phase 3 randomized
Non-inferiority; N=252 HER2+ EBC



SC Phesgo vs IV Pertuzumab + Trastuzumab

Similar PK and pCR rate

Patient Preference Study

Phrancesca Trial (n=160 HER2+ EBC)

85% preferred SC

13.8% preferred IV

1.3% no preference

AE rates similar between SC and IV

Ismael et al. Lancet Onc 2012; 13(9): 869-78; Jackish et al. JAMA Onc 2019; Gilgorov et al. Eur J Cancer 2017; 82: 237-46;

Tan et al. Lancet Onc 2021; 22(1): 85-97; O'Shaughnessy et al. Eur J Cancer 2021; 152:223-32

Comparison between SC versus IV Trastuzumab +/- Pertuzumab

Main differences

Fixed dose

Short treatment time

Short observation time post-administration

	IV Pertuzumab	IV trastuzumab	SC Trastuzumab	SC Phesgo
Loading dose	840mg	8mg/kg	600mg	1200/600mg
Maintenance dose	420mg	6mg/kg	600mg	600/600mg
Administration time	60 minutes for loading dose 30 minutes for maintenance dose	60-90 minutes for loading dose 30 minutes for maintenance dose	3-5 minutes (5ml)	8 minutes for loading dose (15ml) 5 minutes for maintenance dose (10ml)
Observation time	30-60 minutes	30-60 minutes	30 minutes for loading dose 15 minutes for maintenance dose	

Subcutaneous HER2 Therapies

Impact on Patients' Quality of Life

Reduces infusion time and chair time (relevant even when co-administered with IV chemotherapy)

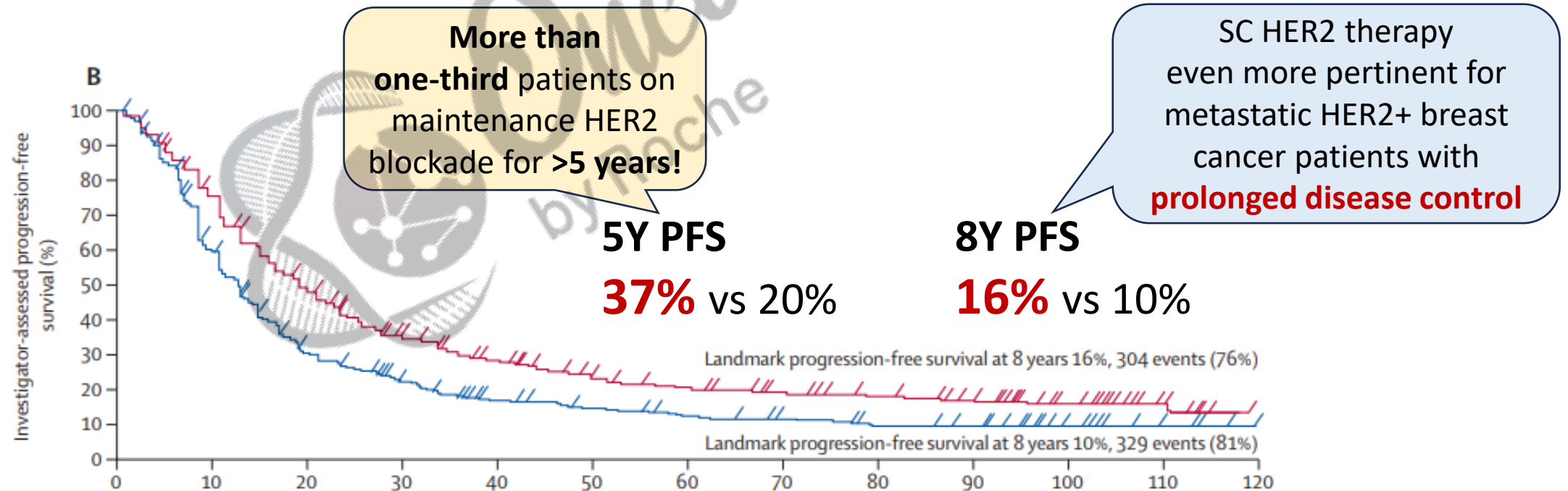
But particularly relevant during maintenance phase (off chemotherapy)

Adjuvant setting: duration of maintenance HER2 blockade **6-8 months**

1st line metastatic maintenance: median PFS **18 months** in CLEOPATRA trial

Long Term PFS data from CLEOPATRA

(1st line dual HER2 blockade + chemo vs trastuzumab + chemo)



Positive Impact of Subcutaneous Anti-Cancer Therapy on Various Key Stakeholders in the Healthcare System



Patient

Intravenous cannulation not required
Shorter infusion and observation time
High patient satisfaction
Generally **preferred by patients**
(over intravenous treatments)



Nursing

Fixed dose
Lower risk of **drug dosing or drug administration error**
Intravenous cannulation not required
Shorter observation time
Shorter nursing time
Reduces nursing burden



Pharmacy

Fixed dose
Drug preparation simpler and takes less time



Hospital/Health System

Shorter treatment and observation time
Frees up chair time to allow more patients to be treated
Reduces crowding at treatment centre
Reduces exposure to infection
(particularly pertinent in a pandemic!)

Switching from Intravenous to Subcutaneous Pertuzumab + Trastuzumab can lead to **~80% Reduction in Non-Drug Costs** in the **West**

For a typical patient receiving treatment for HER2-positive eBC in **Western Europe**,* switching from IV PH to SC PH FDC can lead to:



Up to **85%**
savings on
chair time costs



Up to **69%**
savings on **non-drug**
consumables costs



Up to **76%**
savings on active
HCP time costs

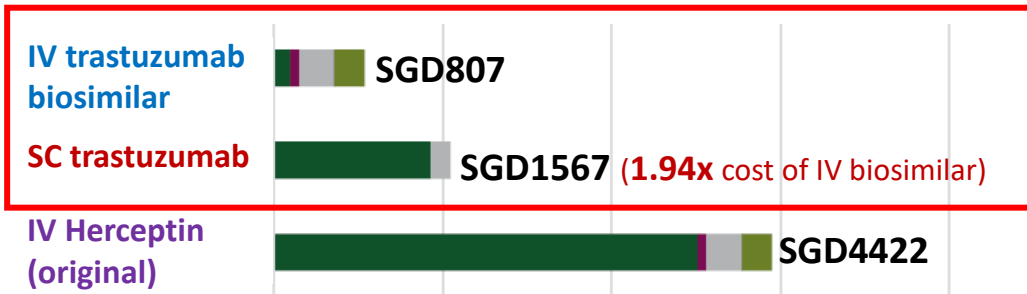


Up to **65%**
savings on **patients'**
productivity losses

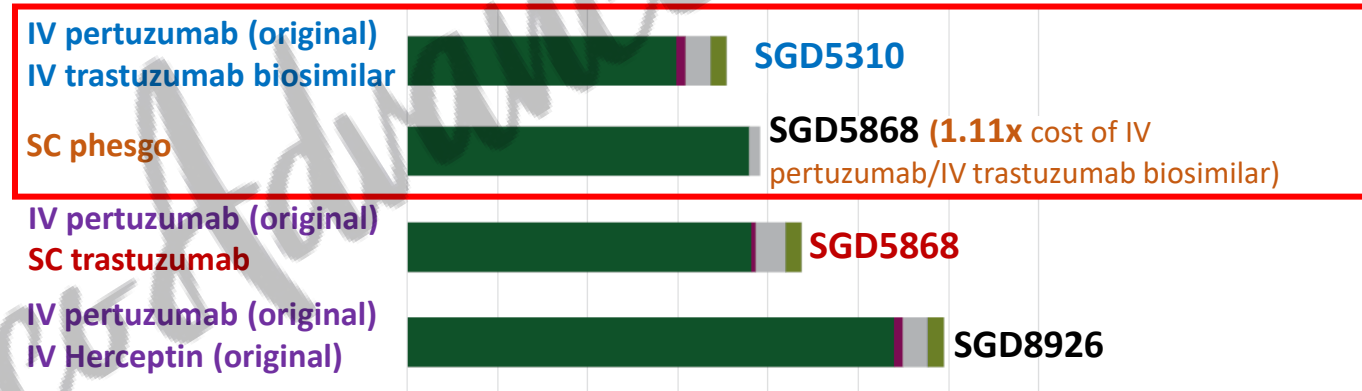
** Data from a model-based cost-minimisation analysis to quantify non-drug cost differences per patient over a full course of eBC therapy (18 cycles of PH IV vs. PH FDC SC). Western Europe estimates. Manevy F, et al. ASCO 2021 (abstract 544)*

Cost Analysis of Subcutaneous vs Intravenous HER2 Therapy accounting for **Non-Drug Costs** in **Singapore**

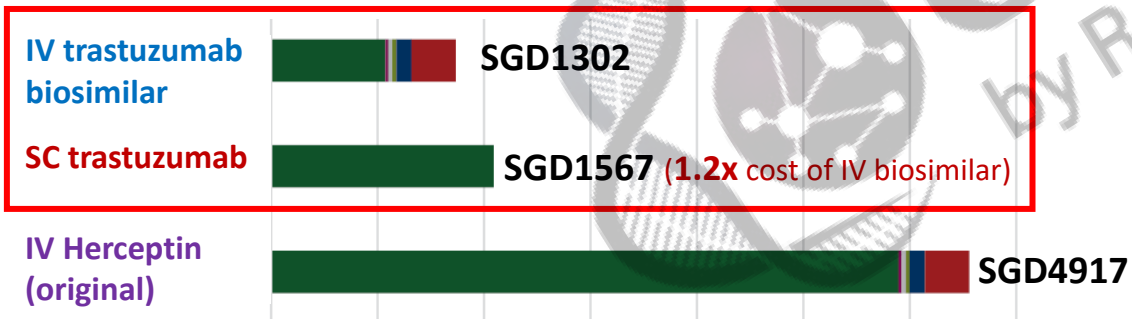
Estimated direct costs of **single agent HER2 blockade**



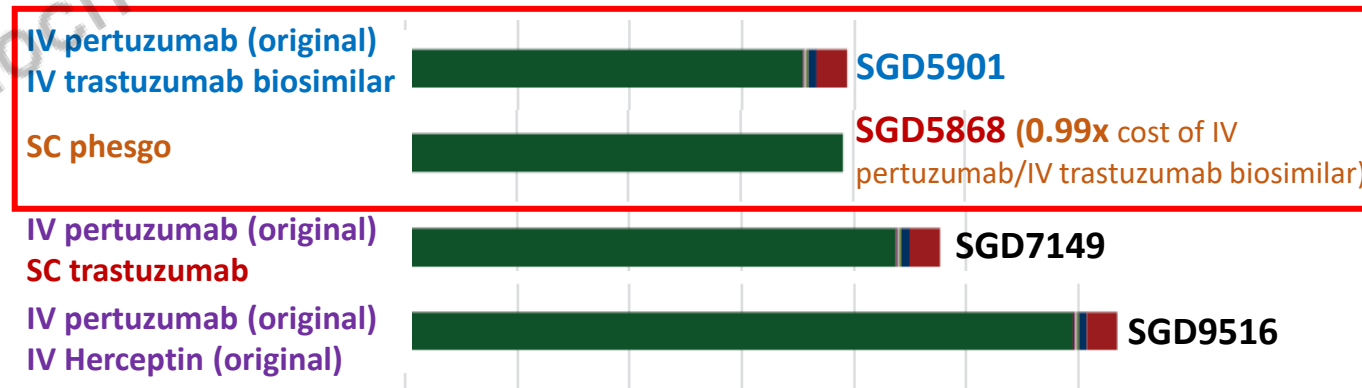
Estimated direct costs of **dual HER2 blockade**



Estimated direct + indirect costs of **single HER2 blockade**



Estimated direct + indirect costs of **dual HER2 blockade**

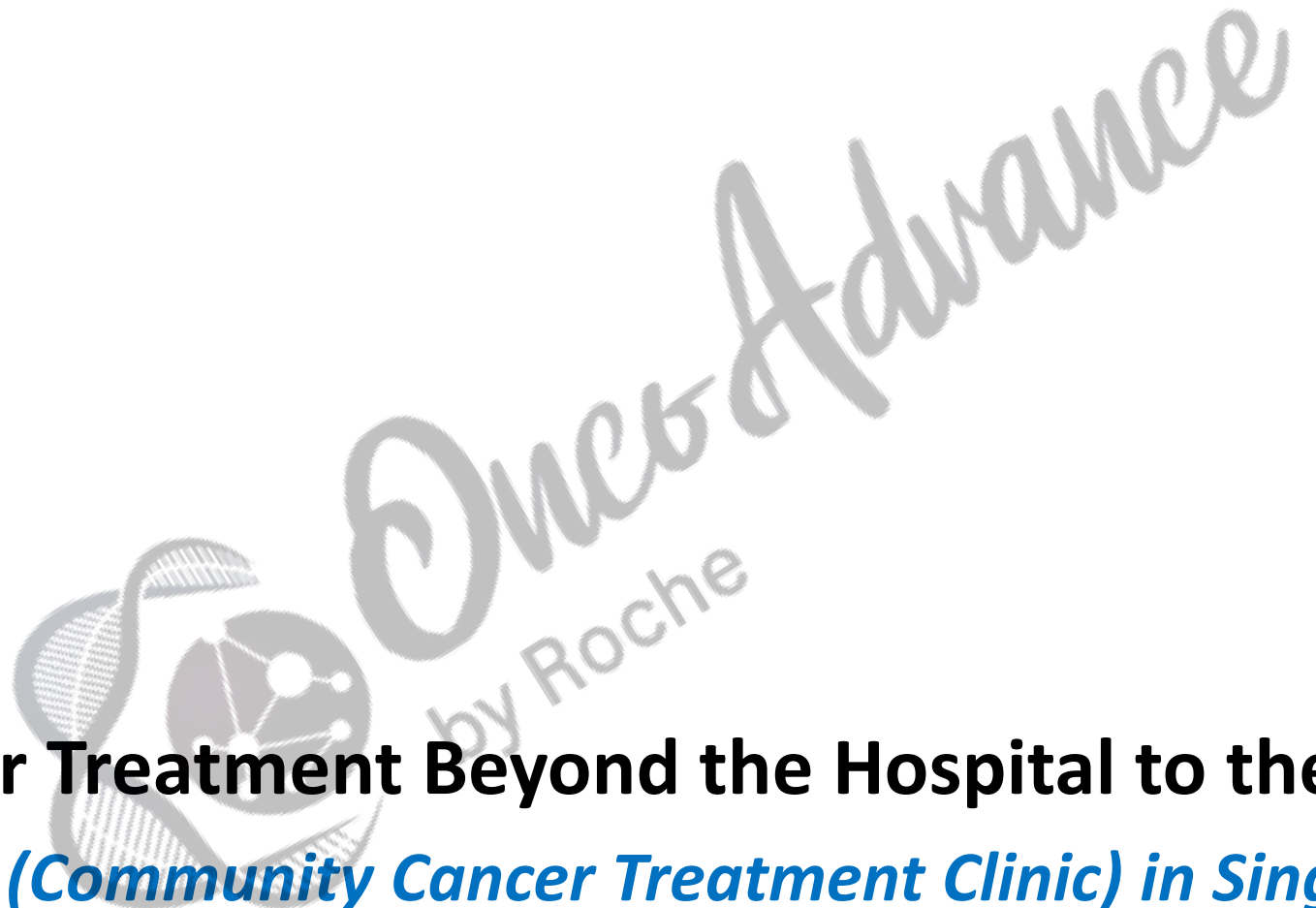


Direct cost: Drug cost, pharmacist preparation charges, chair time at tertiary centre, premedication costs, cost of venous port implantation

Indirect cost: Travelling costs, travelling time, waiting time, nursing time, **opportunity cost (chair time at tertiary centre)**

Subcutaneous Monoclonal Antibodies approved by the US FDA to treat Solid Tumors

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PHESGO (SC pertuzumab + trastuzumab)	June 2020	rHuPH20	Loading dose 15ml over 8 minutes Maintenance dose 10ml over 5 minutes , q3w
Tecentriq Hybreza (SC atezolizumab)	Sep 2024	rHuPH20	15ml over 7 minutes , q3w
Opdivo Qvantig (SC nivolumab)	Dec 2024	Recombinant human hyaluronidase-nvhy	3.6ml q3w over 3-5 minutes , q3w 4.8ml q4w over 3-5 minutes , q4w
Keytruda QLEX (SC pembrolizumab)	Sep 2025	Berahyaluronidase alfa-pmph	2.4ml over 1 minute , q3w 4.8ml over 2 minutes , q6w



Moving Cancer Treatment Beyond the Hospital to the Community

NCIS-On-the-Go (Community Cancer Treatment Clinic) in Singapore

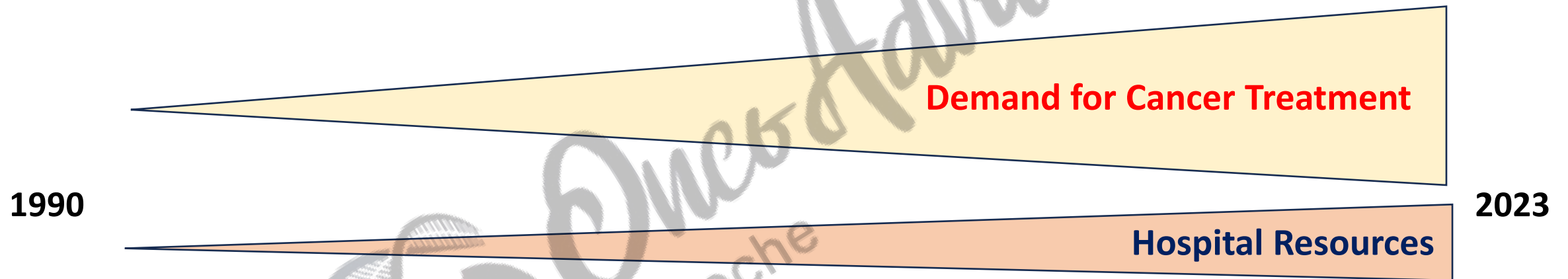
National University Cancer Institute, Singapore (NCIS)



One of two **tertiary comprehensive cancer centres** in Singapore

- Full range of cancer services for adults and children
- Serves about 40% of Singapore's cancer patients in the public sector
- Catchment area: within 30km (home to hospital)

Increase in Demand for Cancer Treatment is Disproportionate to the Increase in Hospital Resources



Only modest increase in hospital resources for cancer treatment in the past 30 years in Singapore
(disproportionate to the increase in demand for cancer treatment)

The '3 Beyonds': Singapore's strategy to sustain quality healthcare as demand rises

Ministry of Health, Nov 2017

Beyond Healthcare to Health

Beyond Hospital to Community

Beyond Quality to Value

BEYOND HOSPITAL TO COMMUNITY

Care for patients go beyond hospitals. The idea is to let them receive appropriate care in the community or at home so they can stay well and avoid frequent hospital admissions.



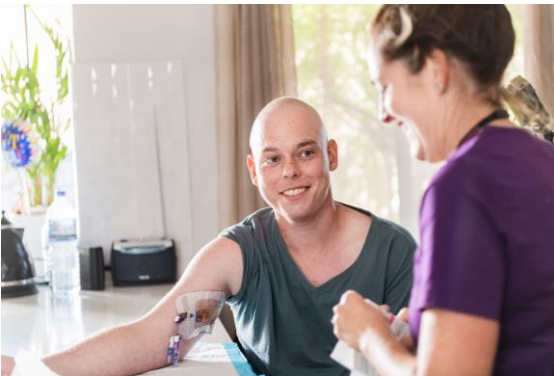
Related Story

This includes post-discharge visits to patients' homes by nurses and care workers to ensure that they remain well. This is done for patients who are deemed at risk of frequent readmission to hospital.

This is better for the patient in terms

Delivering Cancer Treatment **Beyond Hospital to Community**

Home Treatment



Most convenient to patient
Limited range of services
Labour intensive
Expensive to operate
Difficult to scale up

Community Treatment Clinics (e.g., **NCIS-on-the-Go**)



Flexible; can **add** or **change location** fairly easily
Intermediate range of services
Relatively cheap to set up and operate
Relatively **easy to scale up**

Full Service Satellite Treatment Centres



Offer the largest range of services
Requires infrastructure
Very expensive to set up
Takes time to set up
Significant manpower needs
Location is fixed and limited

Delivering Cancer Treatment **Beyond Hospital to Community**

Home Treatment



NCIS 'Home Cancer Treatment' Program' since 2015

Small scale program

For special populations

e.g., patients with disability or mobility issues

Labor intensive, expensive to operate

Difficult to scale up

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Delivering Cancer Treatment **Beyond Hospital to Community**

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Labour intensive
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NCIS-on-the-Go Community Treatment Clinics



Since 2017
Priority to develop this program
Easier to scale up
Can benefit more patients

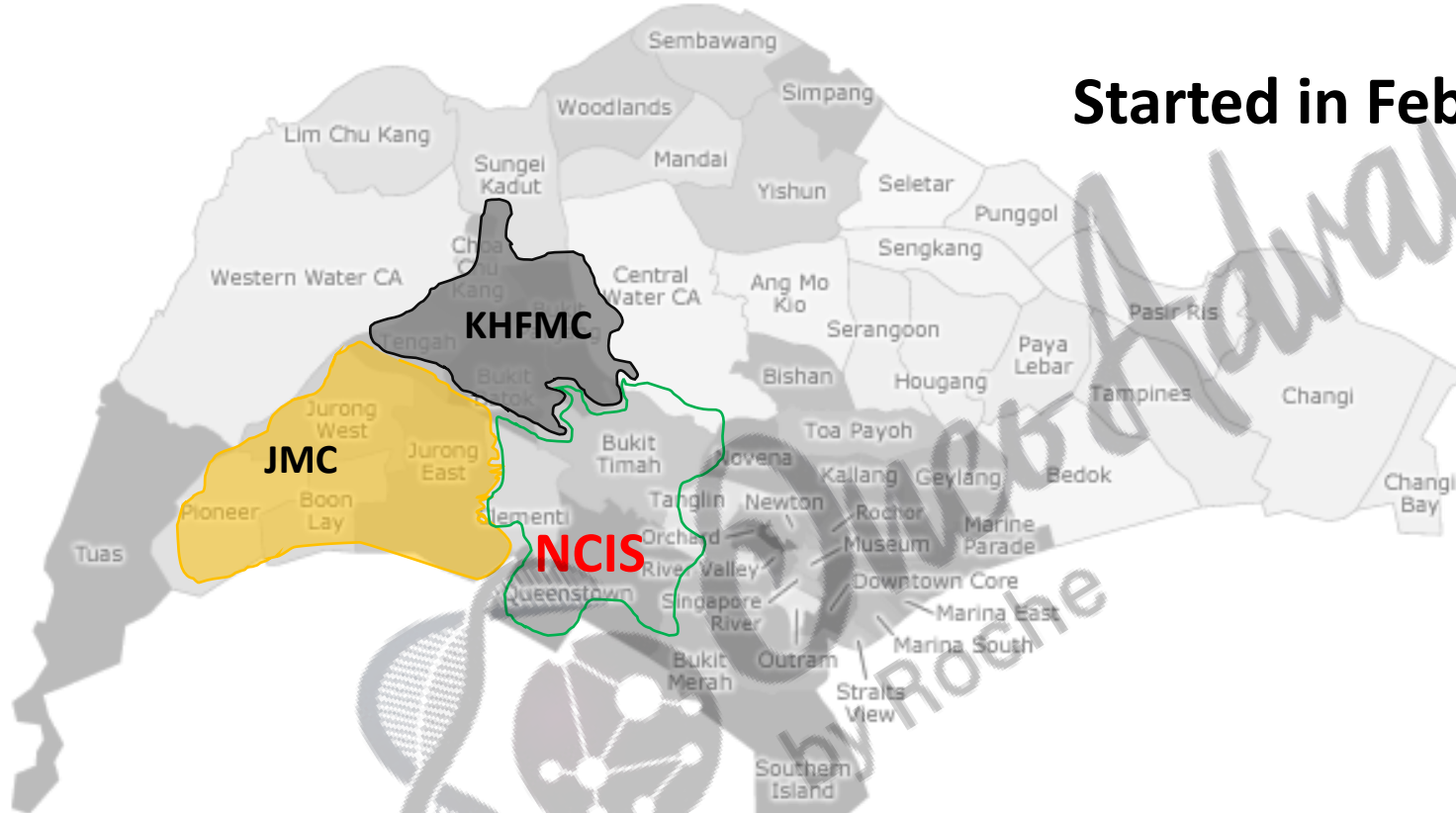
Full Service Satellite Treatment Centres



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Requires infrastructure
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Takes time to set up
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NCIS-on-the Go: *Location & Coverage*

Started in Feb 2017



Jurong Medical Centre (JMC)
13km from NCIS
Mondays to Fridays
9am to 1pm, 2pm to 4pm

Keat Hong Family Medicine Clinic (KHFM)
20km from NCIS
Mondays to Fridays
9am to 1pm, 2pm to 4pm

2 high volume community clinics that operate daily

Choice of locations:

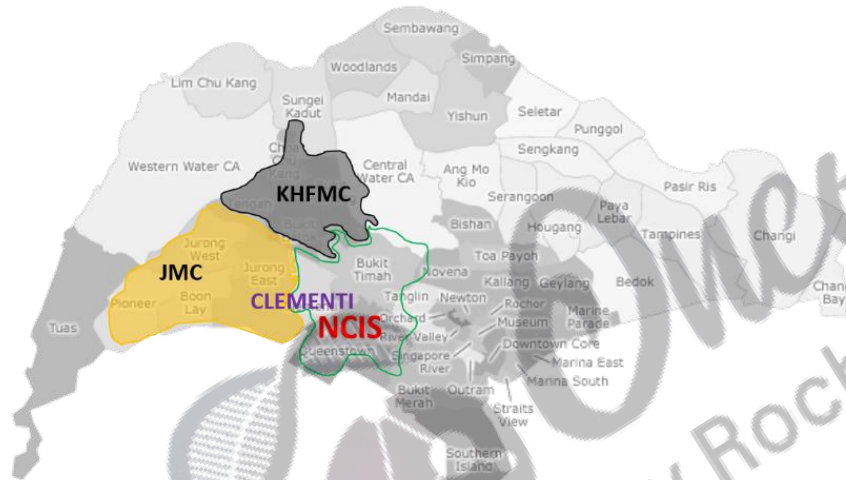
In an **existing medical facility** in the community
Within **residential areas**

Walking distance from MRT train station

Expansion of NCIS-on-the-Go Program: *Third Community Clinic*

Third Community Clinic (Clementi; Frontier FMC) in April 2022

By popular demand!



Closer to the hospital (5km away)

Cater to patients who live closer to the hospital who wish to avoid going to the busy/crowded cancer centre

At capacity utilization within 1 year

? did you know
NCIS ON THE GO
IS COMING TO CLEMENTI!

National University Cancer Institute Singapore

- Care is provided by NCIS oncology nurses
- As safe as undergoing the procedures in the hospital
- Only selected blood tests, injections, treatment and procedures are available

Conveniently Located Near You...

KEAT HONG FMC
(5 mins from Choa Chu Kang MRT)

FRONTIER FMC
(5 mins from Clementi MRT)

JURONG MEDICAL CENTRE
(5 mins from Jurong East MRT)

NCIS

For Appointment/Enquiries
Call 6773 7888 or email cancerapptline@nuhs.edu.sg

For more information and directions, please scan the QR Code or visit www.ncis.com.sg/NCISOTG. \$5 community fee is waived for Singaporeans and PRs. Subjected to changes and GST.

NCIS-on-the-Go Community Treatment Clinics: *Operating Model*

NCIS rents a small clinic space at **existing medical facilities** for NCIS-on-the-Go
Does not require a lot of space, special medical equipment or infrastructure
Very flexible, easy to add or change location without capital investment



NCIS-on-the-Go Community Treatment Clinics: *Operating Model*

Strictly by appointment

Cancer treatments are prepared at Cancer Centre Pharmacy on day of appointment

'Courier' Service up to 3 times daily

From Hospital to Community Treatment Clinics: Drug Treatments

From Community Clinics to Hospital: Blood samples

All procedures at the Community Treatment Clinics follow the **same Standard Operating Procedures as in the hospital**



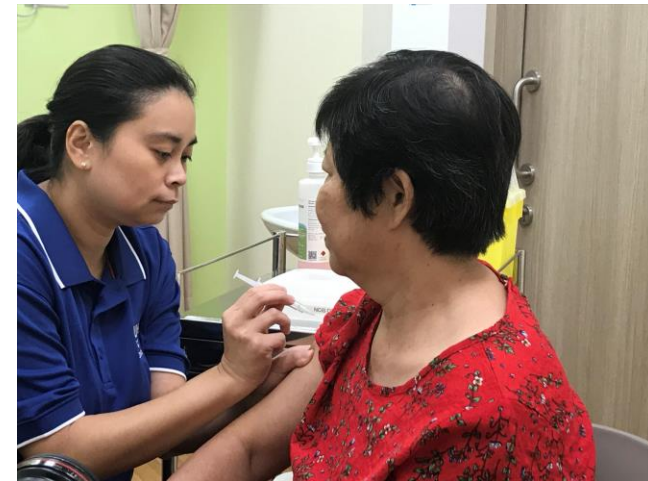
NCIS-on-the-Go Community Treatment Clinics: *Operating Model*

Staffed by an **oncology trained nurse** from the hospital cancer centre who is experienced in cancer treatments and management of emergencies and acute complications

No medical doctors from NCIS deployed to the community clinic

Only **low risk treatments**

- Stable and well patients
- Started the program with **subcutaneous** or **intramuscular** injections with very low risk of acute reactions
- **Extended to short intravenous infusion (IV zoledronate) in April 2023**



Services Provided at NCIS-on-the-Go Community Treatment Clinics



49 blood tests

19 cancer treatments

3 procedures

NCIS-on-the-Go provides cancer services in a **more intimate and familiar environment in the community** that is **less threatening and formidable** to patients than a large busy hospital
Helps to put patients at ease

Procedures Provided

3 Procedures offered

Simple Nursing



Flushing of central or peripheral venous lines

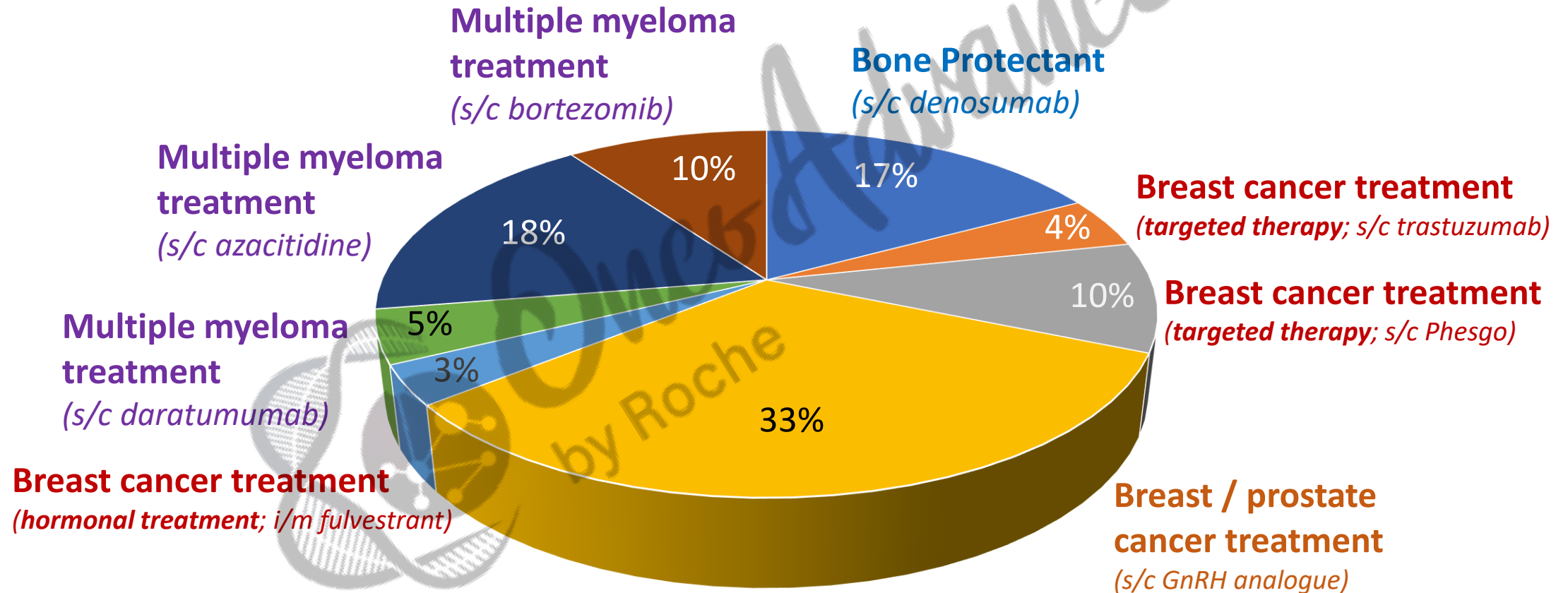


Off chemotherapy infusion pump after chemotherapy completes



Treatments Provided

19 Cancer Treatments offered (**8 High Volume Treatments: ~80%** of all treatments)



■ Denosumab	■ Trastuzumab	■ Phesgo
■ GnRH analogue	■ Fulvestrant	■ Daratumumab
■ Azacitidine	■ Bortezomib	

**based on 9451 consecutive treatments in CY2025*

Patient Experience Survey

Survey conducted between June to August 2023
155 patients (NCIS-on-the-Go users) responded

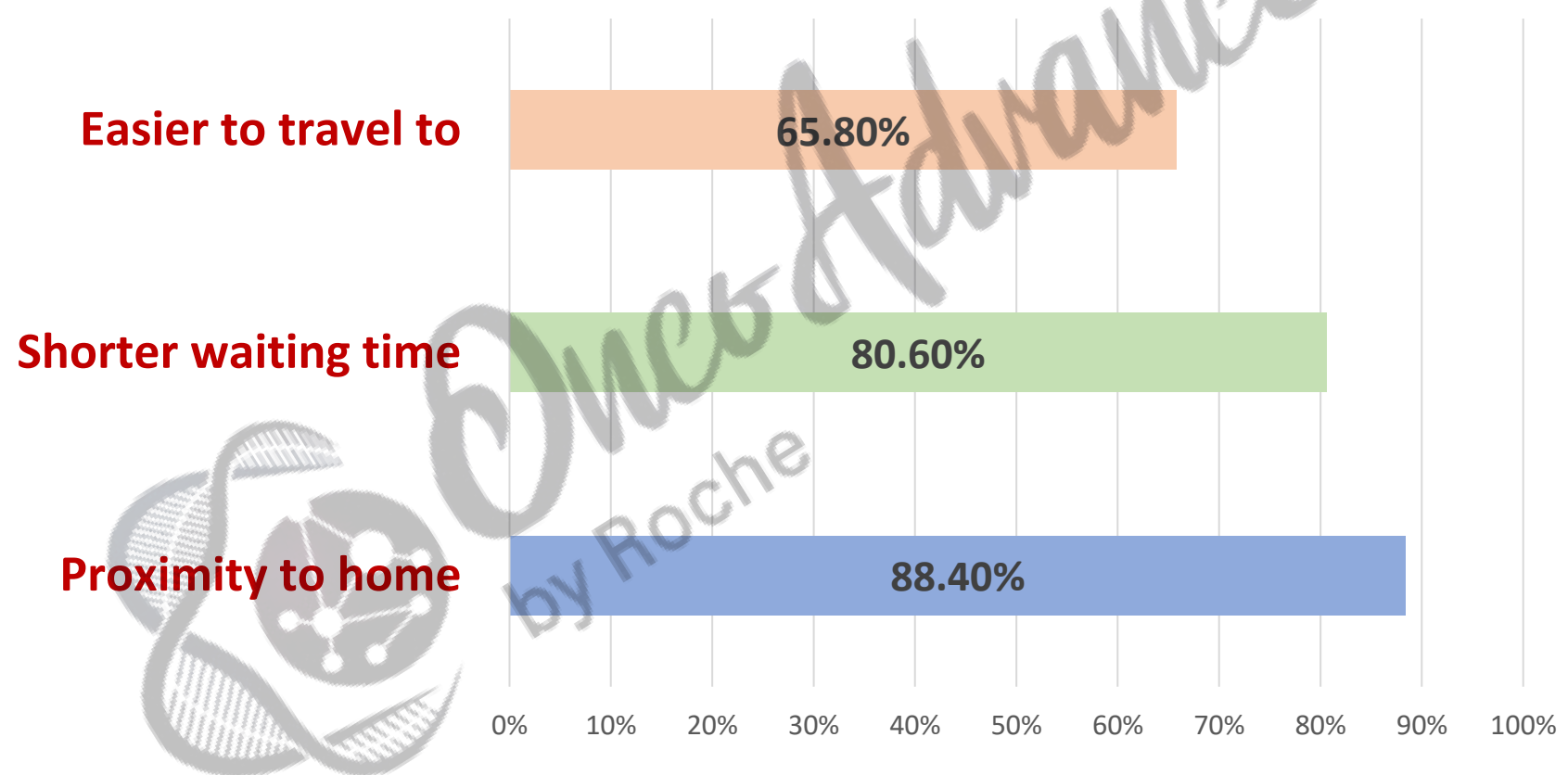
Median age 59 (range 20-83)

90.4% visited NCIS-on-the-Go ≥ 2 times

14.8% 11-20 times

18.7% >20 times

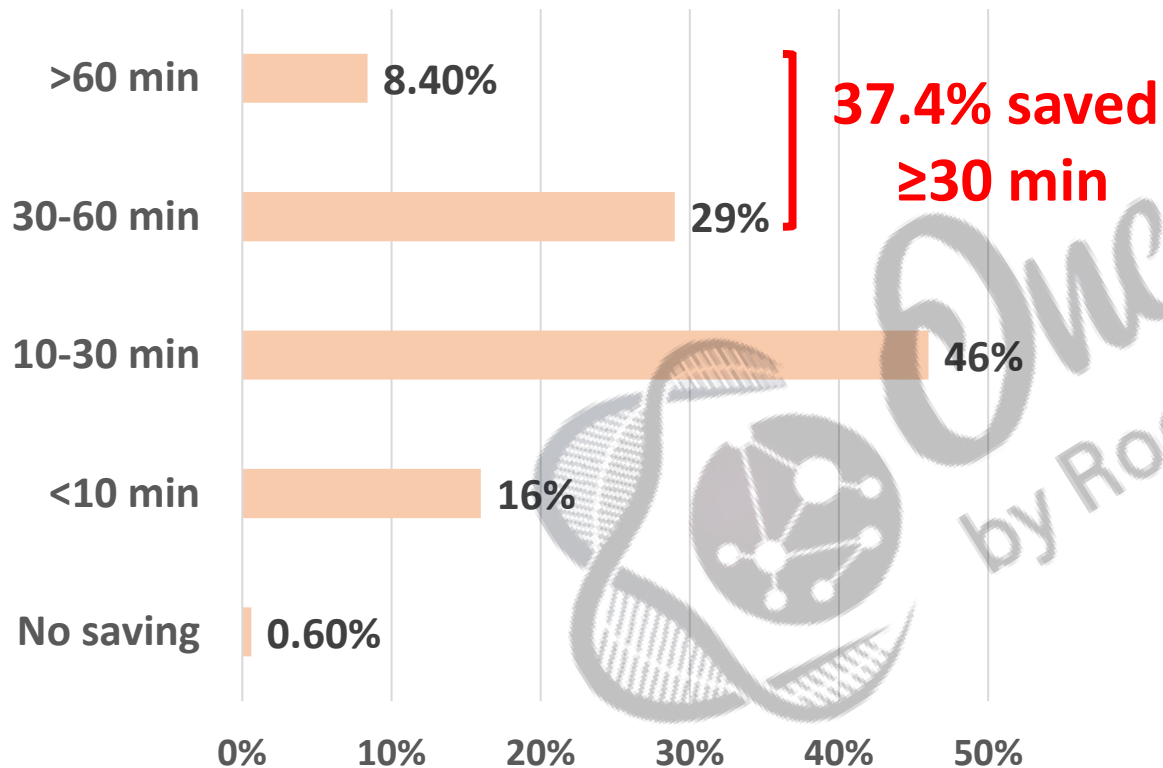
Survey results: *Reasons for using NCIS-on-the-Go Community Treatment Clinics*



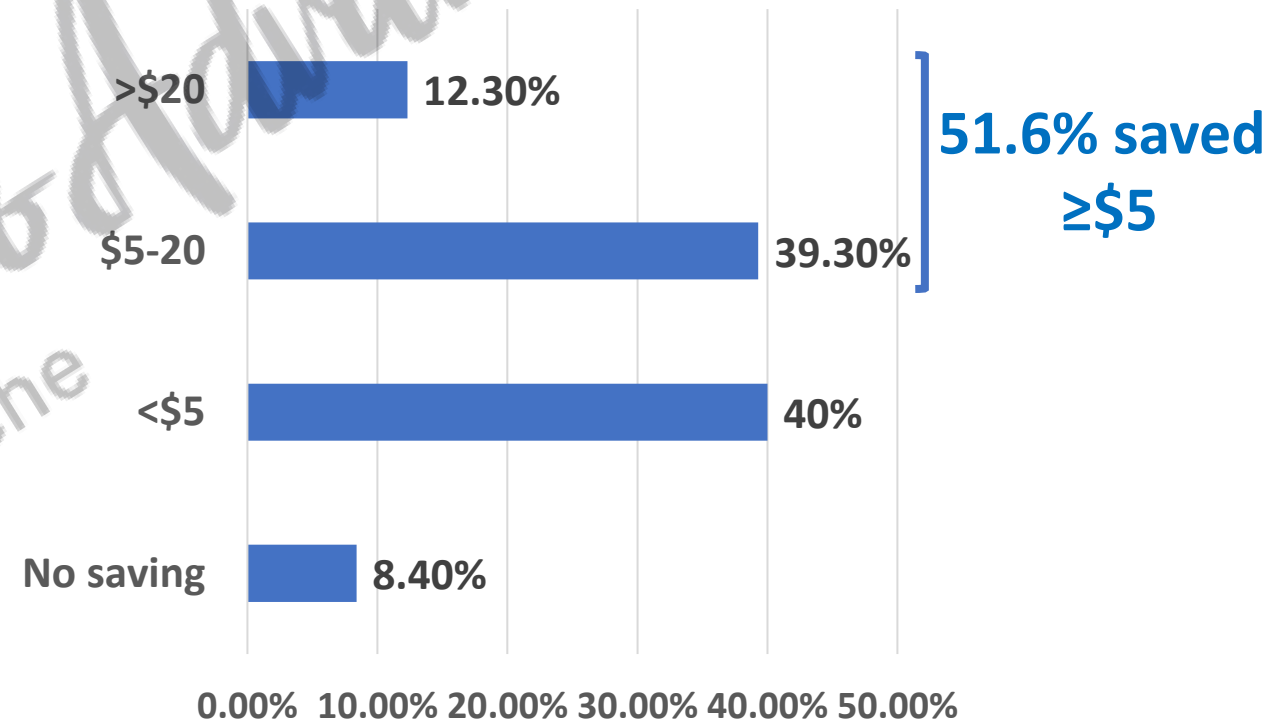
25.8% able to travel alone to these clinics without caregiver (*vs hospital*)

Survey results: *Travelling Time and Travelling Costs*

Saving in Travelling Time



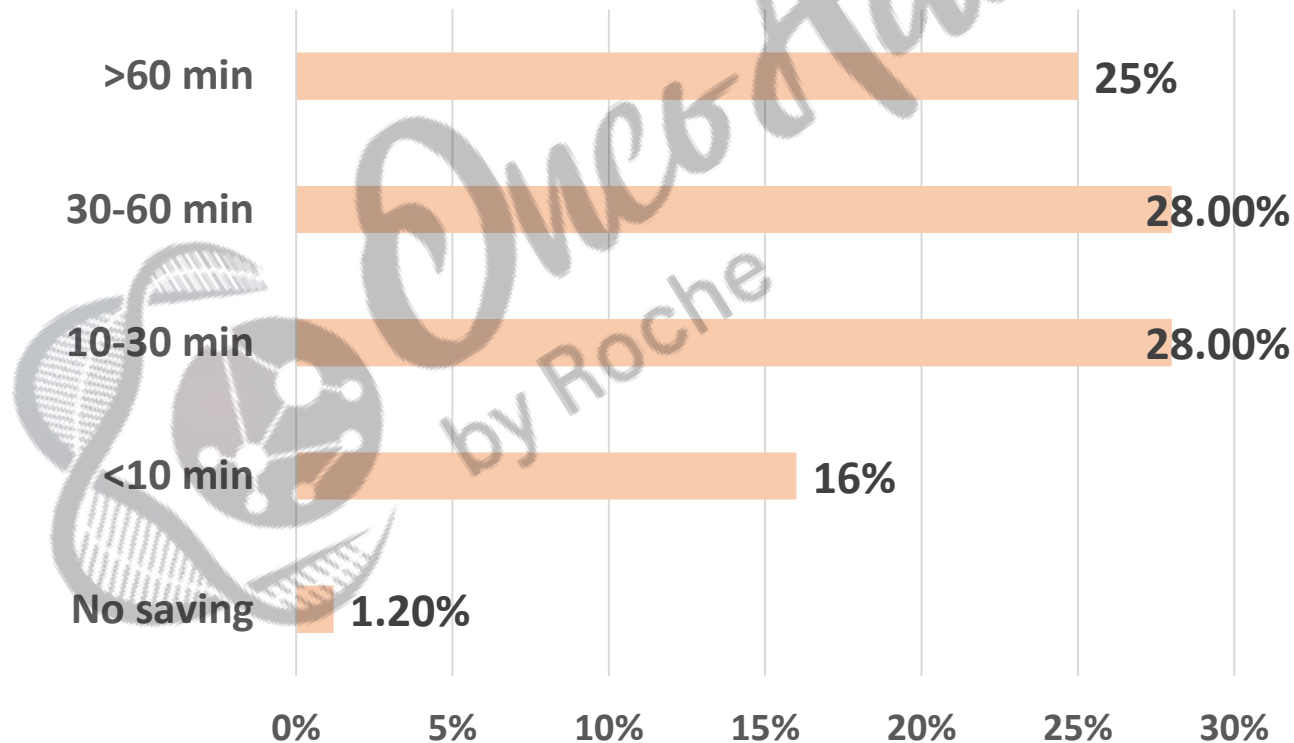
Saving in Travelling Cost



Survey results: *Reduction in Waiting Time*

‘Express’ service provided at NCIS-on-the-Go Community Treatment Clinics
(limited to treatments that can be completed *within 15 minutes*)

Saving in Waiting Time



**53% saved
≥30 min**

Survey results: *Satisfaction with the Service*

Satisfaction with the service

86.5% very satisfied

10.3% satisfied



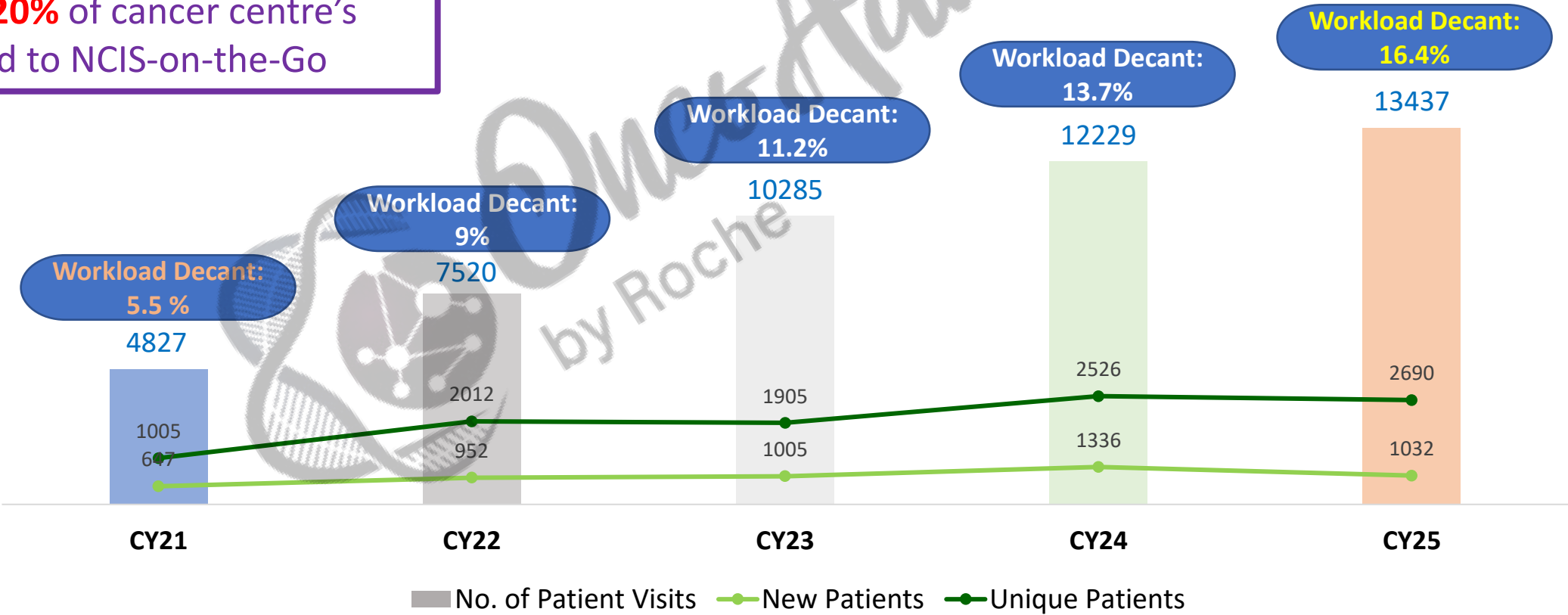
Patient Workload at NCIS-on-the-Go Community Treatment Clinics

Workload increased by **>7 fold** since 2018

Number of unique patients in 2025: **~2700**

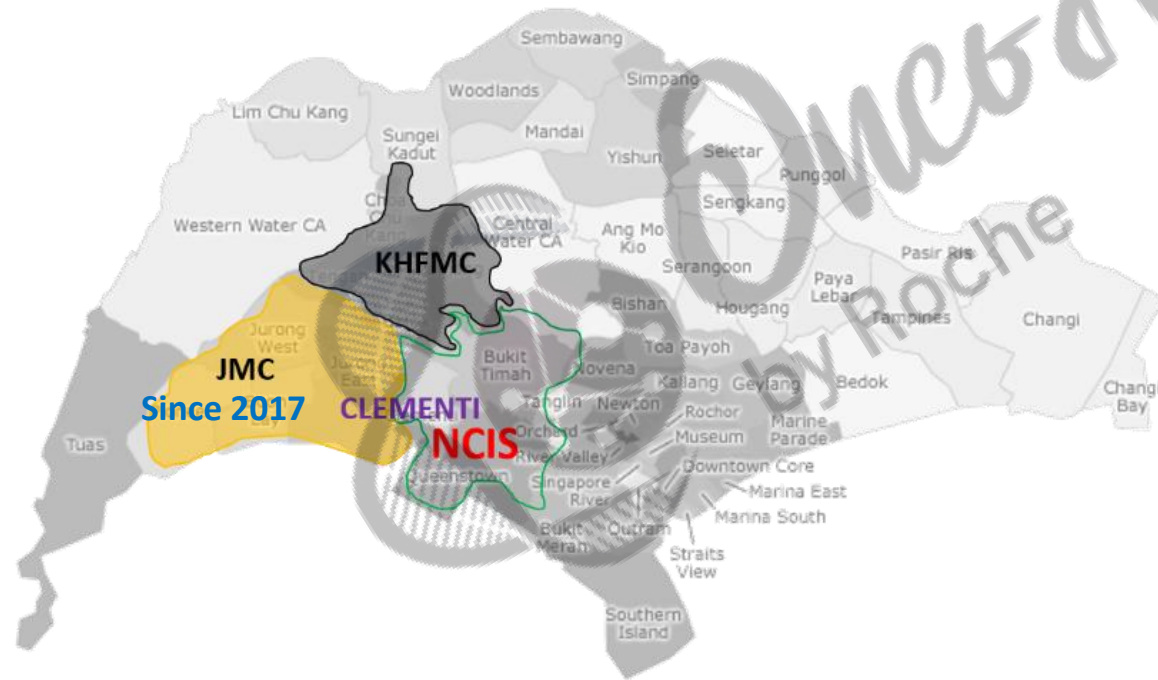
Number of new patients in 2025: **~1000**

Long term vision
Decant **20%** of cancer centre's workload to NCIS-on-the-Go



NCIS-on-the-Go Community Treatment Clinics: *Flexibility in Location*

Moving from Jurong Medical Centre to Pioneer Polyclinic



2023

Informed that building will not
renew lease with JMC

(NCIS-on-the-Go has to move!)

Rented an alternative site in the
same area to replace JMC

(Pioneer polyclinic)

Able to **start operating at the
new site within 12 months
without interruption of service
and without capital investment**

NCIS-on-the-Go Community Treatment Clinics: *Long term Vision*

Expand Service

Obtained licensing approval from Singapore Ministry of Health in June 2026

Other short intravenous infusions that can be completed within 15 minutes (*beyond IV Zoledronate*)

Expanded list of IV infusions

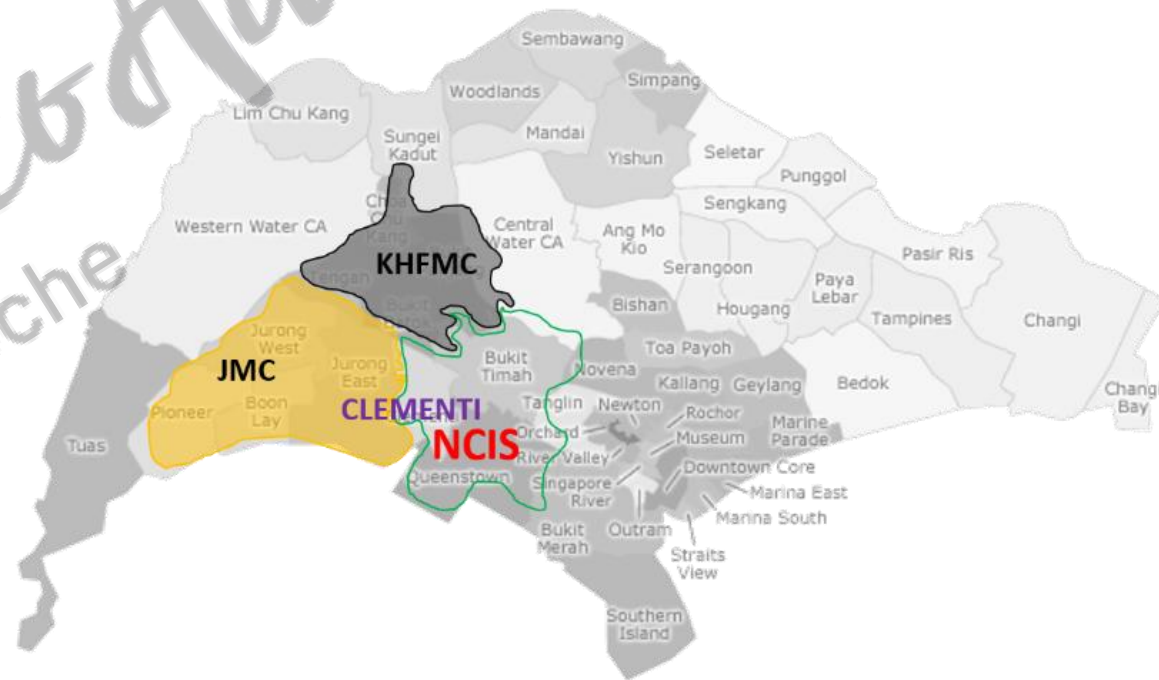
Pembrolizumab
Nivolumab
Trastuzumab
Bevacizumab
Eribulin
Pemetrexed
Methotrexate
5-fluorouracil
Gemcitabine

Expanded list of SC injections

Pembrolizumab
Nivolumab
Atezolizumab
Octreotide

Open more Community Treatment Clinics

Long term vision is for every Singaporean to have access to a community cancer treatment clinic **within 5km from their homes**



Projected to open the **4th community treatment clinic** in **2026 Q4** to cater to patients residing in the **north of Singapore**

NCIS-on-the-Go: *Sharing Expertise with Institutions in the Region*

NCIS-on-the-Go is the first such program in Southeast Asia

Program is **financially viable** and **sustainable in the long term**

Attracted interest from various institutions in the region

- Expertise has been shared with institutions in Malaysia, Thailand, China, Macau and Europe at several regional and international meetings/forums

NCIS-on-the-Go: *Challenges Encountered and Solutions*

Initial 1-2 years of the program

Scepticism and resistance from healthcare providers and patients

Reluctance to take the first step (*concerns about safety, natural preference to stick to the tried-and-tested rather than venture into new territory*)

What did we do?

Publicity materials (posters, pamphlets)

Nurses proactively identify potential patients and encourage them to try the new service

Physician champions

Media stories; **patient advocates**

How have we progressed?

General acceptance among oncologists and patients to receive low risk cancer treatments at the Community Clinic. **Default position to administer subcutaneous / intramuscular cancer treatments only at the community treatment clinics since June 2024!**

July 2024

ORIGINAL RESEARCH

An innovative model of delivering cancer care in the community: the experience of a tertiary cancer centre in Singapore

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¹Department of Haematology-Oncology, National University Cancer Institute Singapore, Singapore; ²Division of Oncology Nursing, National University Cancer Institute Singapore, Singapore; ³Department of Pharmacy, National University Hospital, Singapore; ⁴Cancer Science Institute of Singapore, National University of Singapore, Singapore



Available online 5 July 2024

Background: Cancer care has evolved rapidly, increasing the demand on healthcare resources. While many non-oral cancer treatments are administered in the hospital, not all necessitate complex medical care. Treatments that can be administered subcutaneously, intramuscularly, or as short intravenous infusions with a low risk of extravasation can be safely administered in the community.

Patients and methods: Since 2017, the National University Cancer Institute, Singapore (NCIS) has operated a program called NCIS on-the-go (NOTG) comprising a network of community cancer treatment clinics located within 20 km of the hospital. NOTG provides 17 low-risk treatments and nursing services run by oncology-trained nurses without on-site physicians. Patients who receive their first dose of cancer treatment uneventfully in the cancer centre can opt-in to receive subsequent doses at any NOTG clinic.

Results: Treatment at NOTG has become more mainstream over the years, with its workload increasing by over sevenfold since 2017, and is now responsible for ~10% of the total main cancer centre workload. The program is sustainable and financially viable to operate. A survey of 155 patients revealed a 96.8% user satisfaction rate, with the majority reporting tangible savings in travelling time, waiting time, and travelling costs. The diversion of low-risk treatments to NOTG has indirectly increased capacity and reduced waiting times at the main cancer centre for patients requiring complex cancer treatments, resulting in a win-win situation.

Conclusions: NOTG represents an innovative model of care to deliver low-risk cancer treatments safely in the community and can be easily replicated in other countries.

Key words: community care, cancer, clinic, oncology

NCIS-on-the-Go: *Cancer Treatment in the Community*

Innovative model of care to bring cancer treatment to the community
Aligned with Singapore's strategy of Beyond Hospital to Community
and Global Trend of Decentralized Cancer Care

Relatively **cheap and easy to set up**

Safe and feasible **even for intravenous infusions**

High patient satisfaction

Financially viable and sustainable in the long term



Conclusions

Subcutaneous formulations of HER2 antibodies (*trastuzumab, trastuzumab + pertuzumab*) have been developed that result in **similar PK and clinical efficacy** as the traditional intravenous formulations, and offer a **convenient option** for patients that can be **safely administered beyond the hospital in the community**

Several **checkpoint inhibitors** have also developed **subcutaneous formulations** that have been **approved by the US FDA** (*atezolizumab, nivolumab, pembrolizumab*) adding to the treatment armamentarium for cancer patients

Diverting patients receiving **low-risk cancer treatments** from the **hospital to the community**

- **allows low risk patients to save time and costs**
- **frees up space and time at the tertiary hospital treatment centres for complex patients**
- benefiting all parties within the healthcare ecosystem, representing a **win-win situation**



Thank you for your attention!