

Implementation of oncologist-led delivery of tumour genomic sequencing via circulating tumour DNA to patients with metastatic solid tumours: a multimodality study

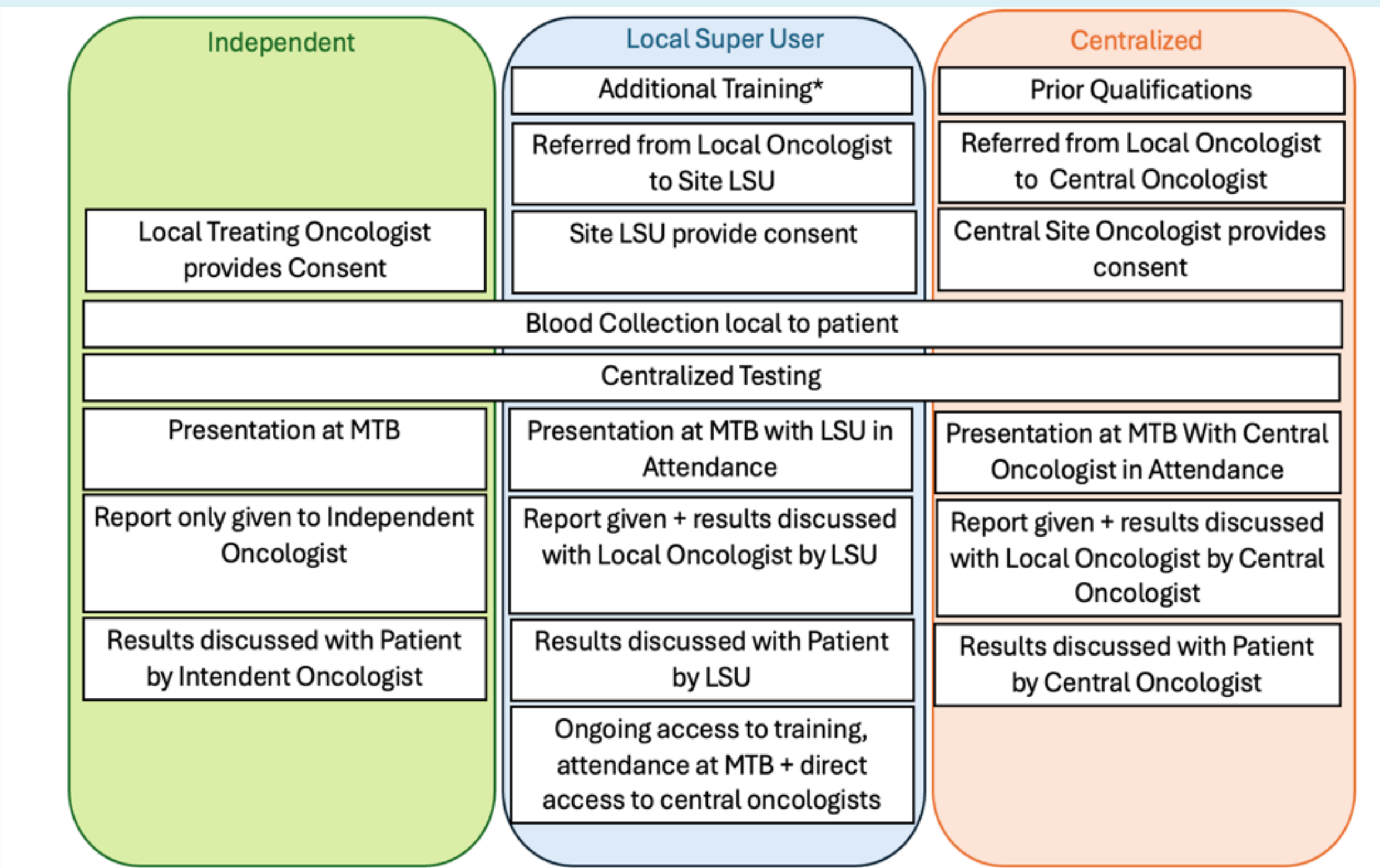
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Background

Circulating tumour DNA (ctDNA)–based complex genomic profiling (CGP) offers a minimally invasive alternative to tissue testing for patients with advanced cancer; however, implementation remains inconsistent across healthcare systems. We evaluated the feasibility, effectiveness, acceptability, and sustainability of oncologist-led ctDNA CGP delivered using three service models across metropolitan and regional settings.

Method

We conducted a prospective, mixed-methods, multicentre implementation study guided by the Consolidated Framework for Implementation Research and Proctor’s Implementation Outcomes Framework. Patients with metastatic solid tumours and oncologists participated across seven sites. Three co-designed models were evaluated: (1) independent (usual care), (2) centralized telehealth, and (3) local superuser (LSU). Quantitative outcomes included testing success, turnaround time, variant detection, and management impact. Qualitative interviews and process mapping explored implementation adaptations. A high-level economic evaluation assessed clinician and patient time costs.



Results

Testing was successful in 99.5% of cases. Variants were detected in 65% of patients and potentially actionable findings in 52%; no significant differences were observed by model or ctDNA assay. Median time from consent to report was <1 month, with the centralized model achieving faster turnaround (26 vs 32 days; P = 0.004). Molecular tumour boards (MTB) were consistently utilized, though attendance varied by model. While 52% of results had potential management impact, treatment change occurred in 5% at 3 months, largely limited by clinical decline or lack of trial access. All sites adapted their assigned model to the local context, relying heavily on a small number of key clinicians. Costs were comparable across models, with trade-offs between efficiency and local flexibility.

	Model 1 Independent N (%)	Model 2 Centralized N (%)	Model 3 Local Superuser N (%)	Total N (%)
Consented	10 (26.3)	12 (31.6)	16 (42.1)	38 (100.0)
Clinical role				
Consultant	7 (70.0)	8 (66.7)	8 (50.0)	23 (60.5)
Fellow	2 (20.0)	3 (25.0)	7 (43.8)	12 (31.6)
Registrar	1 (10.0)	1 (8.3)	1 (6.3)	3 (7.9)
Number of outpatient clinics per week at site				
0 – 1	3 (30.0)	1 (8.3)	1 (6.3)	5 (13.2)
2 – 3	1 (10.0)	8 (66.7)	2 (12.5)	11 (28.9)
4 – 5	3 (30.0)	2 (16.7)	12 (75.0)	17 (44.7)
≥5	3 (30.0)	1 (8.3)	1 (6.3)	5 (13.2)
Number of years working in oncology				
0 – 4	4 (40.0)	3 (25.0)	6 (37.5)	13 (34.2)
5 – 9	2 (20.0)	4 (33.3)	6 (37.5)	12 (31.6)
≥10	4 (40.0)	5 (41.7)	4 (25.0)	13 (34.2)
Tumor stream specialty areas *				
Gastrointestinal cancer	7 (70.0)	9 (75.0)	8 (50.0)	24 (63.2)
Breast cancer	6 (60.0)	9 (75.0)	8 (50.0)	23 (60.5)
Genitourinary cancer	5 (50.0)	4 (33.3)	8 (50.0)	19 (50.0)
Thoracic cancer	7 (70.0)	4 (33.3)	7 (43.8)	18 (47.4)
Melanoma	5 (50.0)	6 (50.0)	6 (37.5)	17 (44.7)
Gynecological cancer	4 (40.0)	3 (25.0)	8 (50.0)	15 (39.5)
Cutaneous cancer	5 (50.0)	3 (25.0)	3 (18.8)	11 (28.9)
Head and neck cancer	3 (30.0)	1 (8.3)	4 (25.0)	8 (21.1)
Neuro-oncology	3 (30.0)	1 (8.3)	4 (25.0)	8 (21.1)
Cancer genetics and prevention	2 (20.0)	2 (16.7)	3 (18.8)	7 (18.4)
Early phase trials	0 (0.0)	0 (0.0)	4 (25.0)	4 (10.5)
Sarcoma	1 (10.0)	1 (8.3)	1 (6.3)	3 (7.9)
Hematology	1 (10.0)	0 (0.0)	0 (0.0)	1 (2.6)

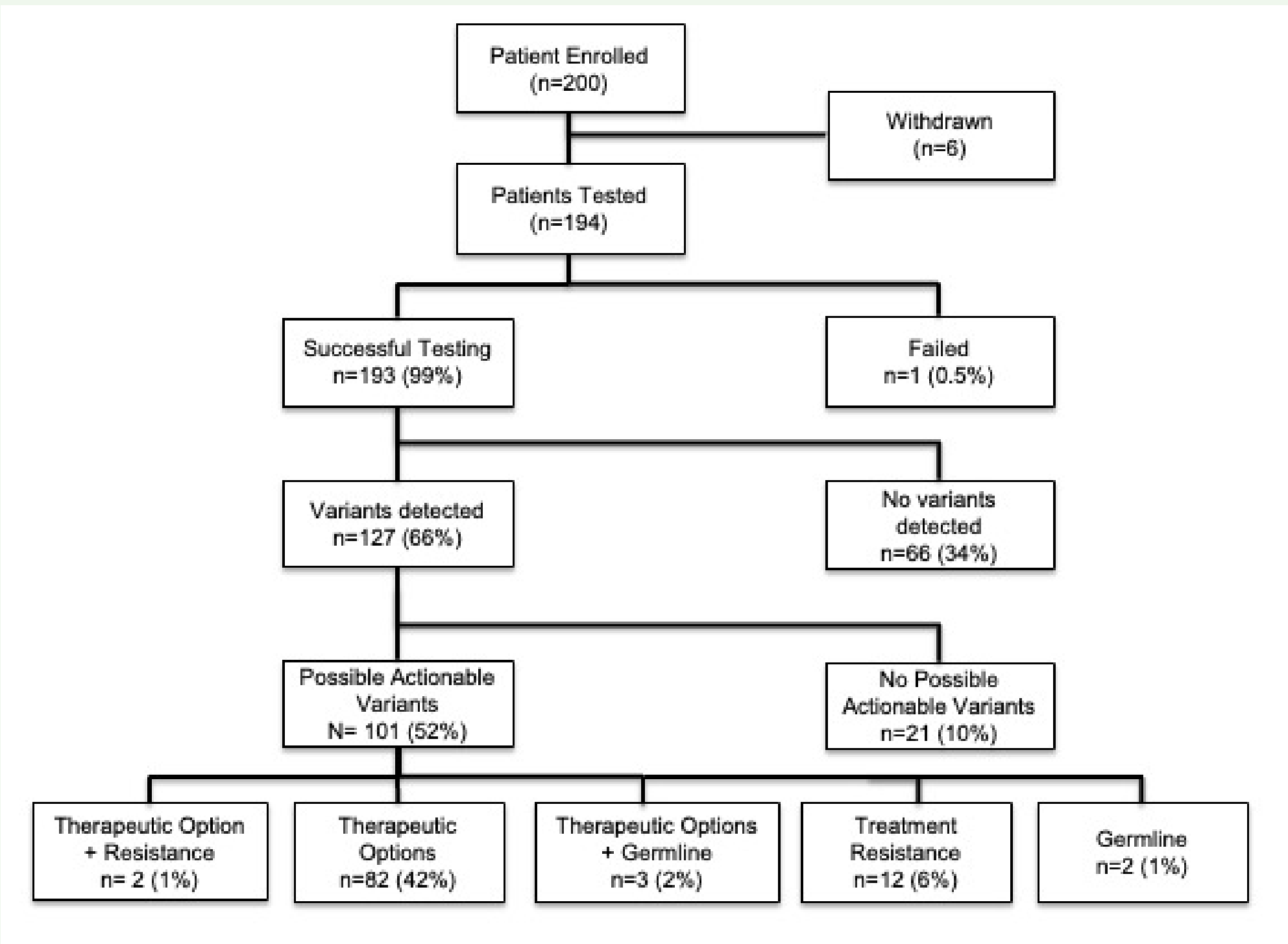


Fig. 2. CONSORT diagram illustrating patient flow through the project and therapeutic suggestions for treatments from molecular tumor board

Table 2: Effectiveness Outcomes via model

	Model 1 Independent N = 63	Model 2 Centralized N = 63	Model 3 LSU N = 68
ctDNA test used			
Test 1	44	14	43
Test 2	7	14	14
Test 3	12	35	11
Testing Outcomes			
Rate of Variants Detected	69.8%	53.9%	72.0%
Process Assessments in days mean (range)			
Time to receipt of sample	3.1 (0–25)	3.7 (0–11)	3.1 (0–30)
Total time to release of report	32.1 (15–50)	26.5 (6–73)	32.1 (7–59)
Attendance at MTB			
Consenting Trial Oncologist	65% ¹	100%	83%
Referring Oncologist	65% ¹	38%	55%
Potential Impact	23 (36%)	20 (32%)	40 (58%)
Clinical Impact at 3 months			
Change in treatment	3	0	2
Not currently on treatment ²	3	6	2
Standard of care treatment	39	35	31
Clinical Trial	3	2	10
Best Supportive Care or (Death)	15 (12%)	17 (8%)	21 (14 died)
Missing data	3	2	4

Conclusion

ctDNA CGP can be feasibly and effectively implemented across diverse care settings using differing service models. Sustainable precision oncology delivery will require flexible, hybrid approaches that leverage centralized expertise, build supported local capacity and reduce reliance on individual clinicians.