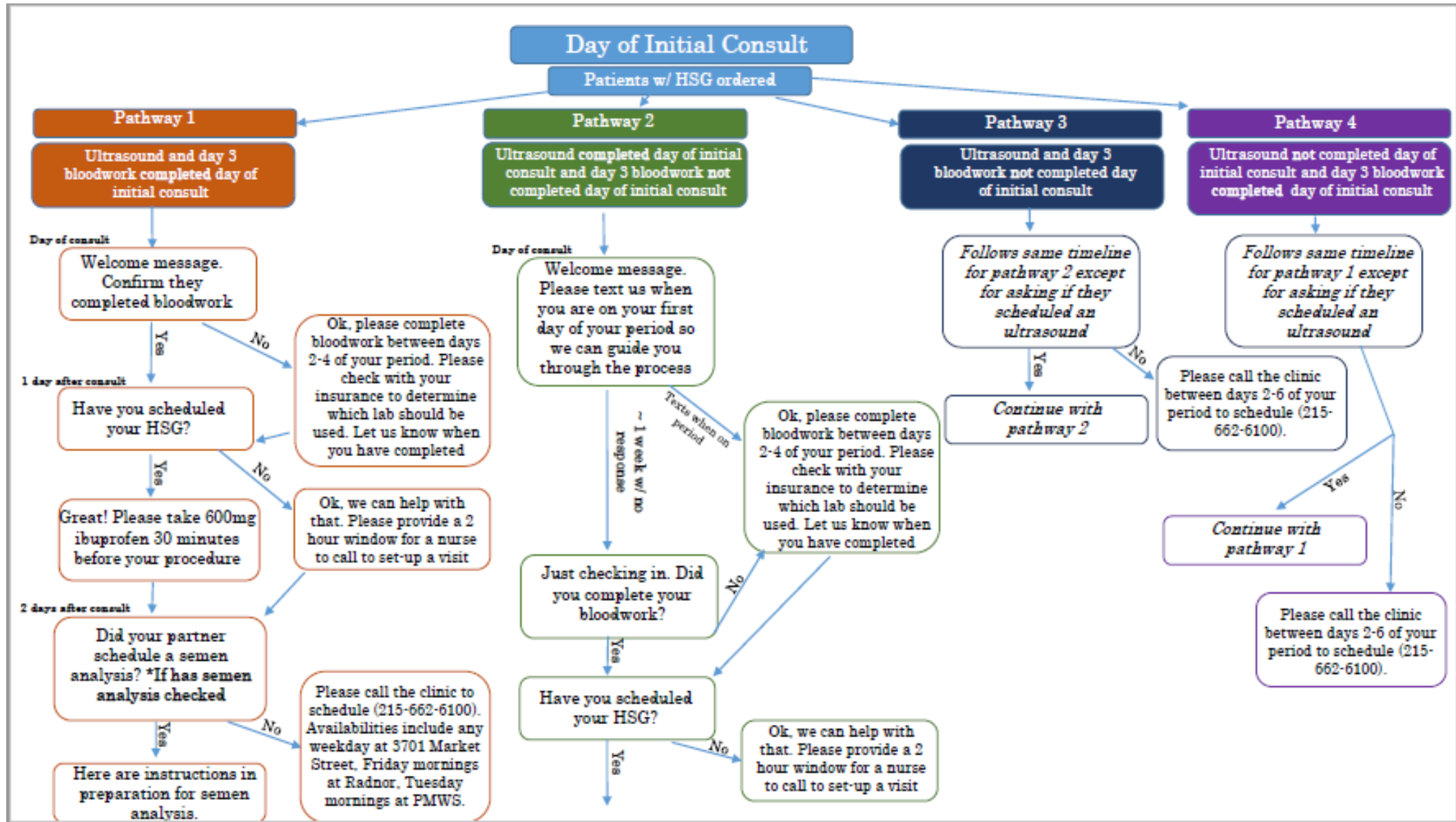


Appendix, Exhibit 1. Branching Logic Used to Develop Algorithms for Fake Back-end Pilot Program



Abbreviations: HSG = Hysterosalpingography; PMWS = Penn Medicine Washington Square

Source: The authors

Appendix, Exhibit 2. Penn Medicine Fertility, Fast Track to Fertility Demographics

	FTF (n=124)	No-FTF (n=58)	
Age	34.3 ± 4.70	34.1 ± 4.95	0.87
Race			
White	73/124 (58.9%)	19/58 (32.8%)	0.004
Black	36/124 (29.0%)	26/58 (44.8%)	
Asian	6/124 (4.84%)	9/58 (1.55%)	
Other (unknown or other)	9/124 (7.26%)	4/58 (22.4%)	
Ethnicity			
Hispanic	8/124 (6.5%)	7/58 (12.1%)	0.25
Non-Hispanic	116/124 (93.6%)	51/58 (87.9%)	
Marital status			
Married	87/124 (70.2%)	27/58 (46.6%)	0.007
Single	32/124 (25.8%)	27/58 (46.6%)	
Other	5/124 (4.0%)	4/58 (6.89%)	
Gravidity			
Nulligravida	68/124 (54.8%)	29/58 (50.5%)	0.46
Primigravida	30/124 (24.2%)	12/58 (20.7%)	
Multigravida	26/124 (21.0%)	17/58 (29.3%)	
Parity			
Nulliparous	93/124 (75.0%)	38/58 (65.5%)	0.32
Multiparous	9/124 (7.3%)	20/58 (34.5%)	
Duration of infertility			
At least 6 months	104/124 (83.9%)	50/58 (86.2%)	0.83
At least 12 months	74/124 (59.7%)	41/58 (70.7%)	0.15
Insurance			
Public	6/124 (4.84%)	13/58 (22.4%)	<0.001
Private	118/124 (95.2%)	43/58 (74.1%)	
None	0	2/58 (3.45%)	
Insurance for diagnostics	118/124 (95.2%)	46/58 (79.3%)	0.002
Insurance for treatment	93/124 (75.0%)	30/58 (51.0%)	0.002

FTF – Patients offered Fast Track to. Fertility who consented

No-FTF – Patient offered Fast Track to Fertility who did not consent

Appendix, Exhibit 3. Development of the Natural Language Processing for Automated Patient Communication Through Text Messaging

Initially, every automatic text message response sent to the patient was reviewed manually to confirm accuracy. Patient questions that could not be interpreted and answered by the NLP automatically generated a notification to the care team indicating follow-up is required. A coordinator would check the messages daily to identify gaps where no content was available and these were escalated to the clinical team within 24 hours for review. In this initial phase of semi-automation, 10–15 minutes per day were spent evaluating the accuracy of interactions. At our weekly meetings, the team continues to review the need for new content and to address gaps (no content). There have been minimal changes to the content over the past 6 months, indicating adequacy of the current content, as of August 2022. We review content mapping accuracy in our monthly metrics and, with refinement, the accuracy of the semi-automated system has gone from to 92% from 53% (see Figure 7 in the main text: Accuracy of the Semi-automated Texting Platform). NLP uses keyword detection to pair keywords to a pre-set response. This is a deterministic model, as opposed to a probabilistic model, which enables a high degree of control and transparency in the NLP process. Initially, keywords were programmed manually and all alternations were made manually. Inbound messages were searched for keywords using NLP and a response was provided — specific to the patient, their diagnostic plan, and stage in the workup process. If the patient prompts questions with varied structures around the same keywords, the NLP system can detect and answer accordingly as opposed to structured algorithms. The responses may include automated follow-up questions with branching logic for dynamic guidance. Proactive, scheduled messages are also sent with the same branching logic as simple static text. NLP allows for dynamic guidance: Patients are

not dependent on structured messages to progress through their journey and they are supported with fewer reminders as a result of patient-led inputs reporting questions or work-up progress made possible through the NLP system. Patients are also able to ask relevant questions in real time. Response categories of NLP-based responses include: clinical guidance and FAQs (how to determine cycle start, uterine cavity evaluation pre-appointment instructions), administrative guidance and FAQs (when to schedule test/appointment, clinic locations or phone numbers) and conversational pleasantries.