Table S1 Mobile Outpatient Specialist Appointment Registration Procedure for patients and specialists

Steps	Procedure for patients
1	The patient registers on the WeChat official medical service account of Renji Hospital using a mobile phone.
2	The patient reads the online specialist directory of the hospital and the diseases in which the specialist specializes.
3	The patient selects a specific specialist and requests an appointment by accessing the "Precise Reservation Path (PRP)" label.
4	The patient confirms the informed consent of the PRP, protocol, and submission of medical records.
5	According to the requirements of different specialist protocols, the patient also needs to submit relevant past examination reports (no earlier than 3 months), such as blood laboratory tests, ultrasound rays, computed tomography (CT), magnetic resonance imaging (MRI), and pathological reports.
6	If approval is received from the specialist users, the patient is allowed to visit the specialist offline on the appointed day.
Steps	Procedure for specialists
1	The specialist team user registers on the official WeChat accounts of Renji Hospital to build a PRP account using a mobile phone and obtains approval from the PRP system administrator.
2	The specialist team user completes their individual profile, including information about diseases in which they are specialized, past examination reports, and informed consent for patients before obtaining approval from the hospital's information administrator.
3	The specialist team user responds to patients' requests in a timely manner.
4	A specialist team user approves or rejects the patient's application. In the event of rejection, the user provides specific advice, such as recommending a well-matched subspecialty for the patient or suggesting a referral to their general practitioner.

Table S2 The classifications and measures of variables of interest

Variables	How to measure	Type
Whether having Passed the Review	1=Yes；0= No	Categorical
Age	1=18-34 years; 2=35-59 years； 3=60-74 years; 4=75 years or above	Categorical
Gender	1=Male ;0=Female	Categorical
If having a Preference to pay with Insurance	1=Yes; 0=No	Categorical
Acdemic title of the specialist	1=Senior specialist; 2=Associate senior specialist	Categorical
Surgical department or not	1=Yes; 0=No	Categorical

Table S3 Operational Profile of 26 Departments participating in the PRP Program

Clinic department	Application count	Pass rate(%)	Patients age Median	Patients age IQR	Patients gender ratio(male/female)	Insurance patient ratio (%)	Patient application count for senior specialist	Patient application count for associate senior specialist	Senior specialist applicant ratio(%)	PRP program specialists	Total specialists	PRP specialists proportion(%)	Average specialist applications
Urinary Surgery	11142	37.4*	64	17	3.85	71.6	2012	9130	18.1	14	37	38	795.9
Breast Surgery	10097	18.3	44	20	0.01	74.4	6397	3700	63.4	5	5	100	2019.4
Thoracic Surgery	9332	27.7	56	22	0.57	65.0	9332	0	100.0	1	6	17	9332.0
Obstetrics And Gynecology	4862	44.8*	39	19	0	76.3	3432	1430	70.6	4	35	11	1215.5
Gastrointestinal Surgery	4716	38.6*	59	26	1.37	71.2	2364	2352	50.1	6	29	21	786.0
Nephrology	4011	42.0*	57	28	0.93	82.8	1955	2056	48.7	6	17	35	668.5
Head And Neck Surgery,	3256	52.7*	49	22	0.31	77.7	126	3130	3.9	2	5	40	1628.0
Biliary And Pancreatic Surgery	3076	47.3*	59	25	0.83	77.0	1601	1475	52.1	12	25	48	256.3
Radiotherapy	1551	55.1*	61	19	1.14	61.5	1261	290	81.3	3	7	43	517.0
Traumatic Orthopedics	1406	36.8*	44	32	0.89	76.4	0	1406	0.0	1	10	10	1406.0
Vascular Surgery	835	26.1	64	18	0.96	76.3	605	230	72.5	4	9	44	208.8
Rheumatology And Immunology	790	2.2	47	24	0.3	40.0	720	70	91.1	3	20	15	263.3
Cardiology	692	17.1	61	27	0.81	80.1	206	486	29.8	4	25	16	173.0
Joint Surgery	483	44.3*	55	27	0.56	72.3	421	62	87.2	4	9	44	120.8
Gynecological Oncology	478	61.5*	47	20	0	55.0	454	24	95.0	2	3	67	239.0

Otorhinolaryngology	470	33.4	47	25	1.02	77.0	143	327	30.4	4	8	50	117.5
Spine Surgery	445	56.4 *	66	24	0.79	79.8	445	0	100.0	1	9	11	445.0
Ophthalmology	237	43.5 *	64	27	0.72	72.6	0	237	0.0	1	12	8	237.0
Pain Medicine	143	40.6*	60	27	0.72	60.1	0	143	0.0	1	2	50	143.0
Functional Neurology	120	0.0	44	30	1.03	59.2	0	120	0.0	1	1	100	120.0
Oncology	49	51.0*	60	19	0.96	32.7	49	0	100.0	1	12	8	49.0
Plastic Surgery	25	28.0	41	18	1.27	84.0	0	25	0.0	1	5	20	25.0
Digestion Medicine	21	0.0	52	20	0.91	38.1	21	0	100.0	1	44	2	21.0
Diagnostic Radiology	18	55.6*	64	50	0.38	27.8	0	18	0.0	1	16	6	18.0
Endocrinology	13	0.0	41	20	1.17	53.9	13	0	100.0	1	10	10	13.0
General Surgery	3	0.0	34	/	0	100.0	3	0	100.0	1	8	13	3.0
Total	58271	34.8	54	26	0.63	72.2	31560	26711	54.2	85	369	23.04%	685.5

Note:

Patients age Median: Median age of patients applying

Patients age IQR: Age IQR of patients applying

Patients gender ratio: Gender ratio of patients applying(male/female)

Insurance patient ratio (%): Proportion of insurance among the patients applying

Senior specialist applicant Ratio(%): Proportion of patient apply for senior specialist among all applicants

PRP program specialists: Number of specialists participating in PRP program

Total specialists: Total number of specialists in department

PRP specialists proportion(%):Proportion of specialists participating in the PRP program to the total number of specialists in department

Average specialist applications: Average of patients applying for one specialist in department

Tabe S4 The Role in Random Forest Model and Result of Predictor Importance

Variables	Role in random forest model	Predictor importance
Patients age Median	input	0.93
PRP specialists proportion	input	0.87
Average specialist applications	input	0.84
Total specialists	input	0.53
Insurance patient ratio	input	0.35
PRP program specialists	input	0.35
Patients gender ratio	input	0.22
Application count	input	0.16
Senior specialist applicant ratio	input	0.12
Pass Rate Interval	target	/

Tabe S5 The Role in ANN Model and Result of Predictor Importance

Variables	Role in ANN model	Predictor importance
Specialist	input	0.44
Clinic department	input	0.43
Patient age group	input	0.07
Acdemic title of the specialist	input	0.04
Gender	input	0.02
Assessment result(yes or no)	target	/

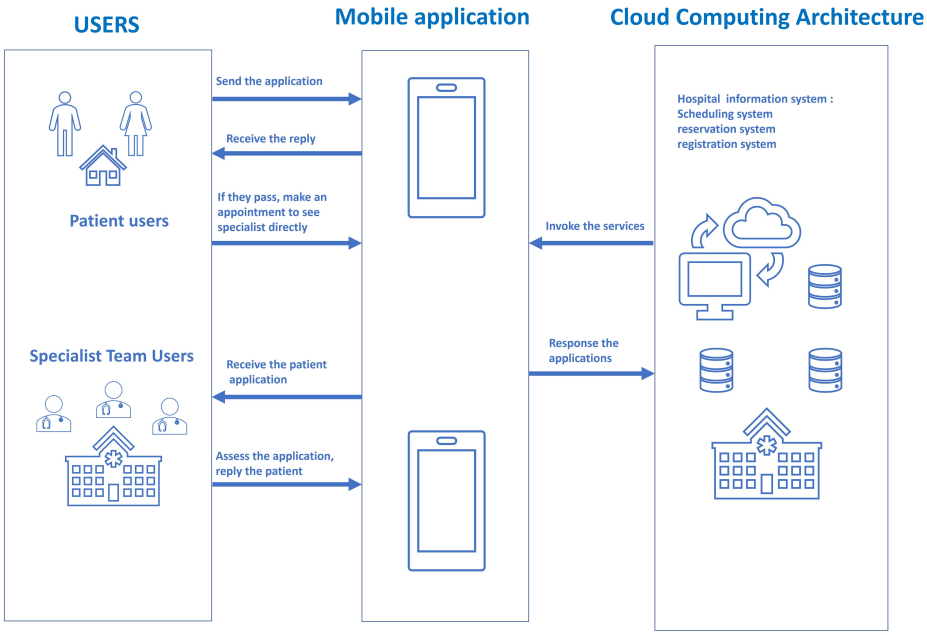

Figure S1. The PRP model architecture

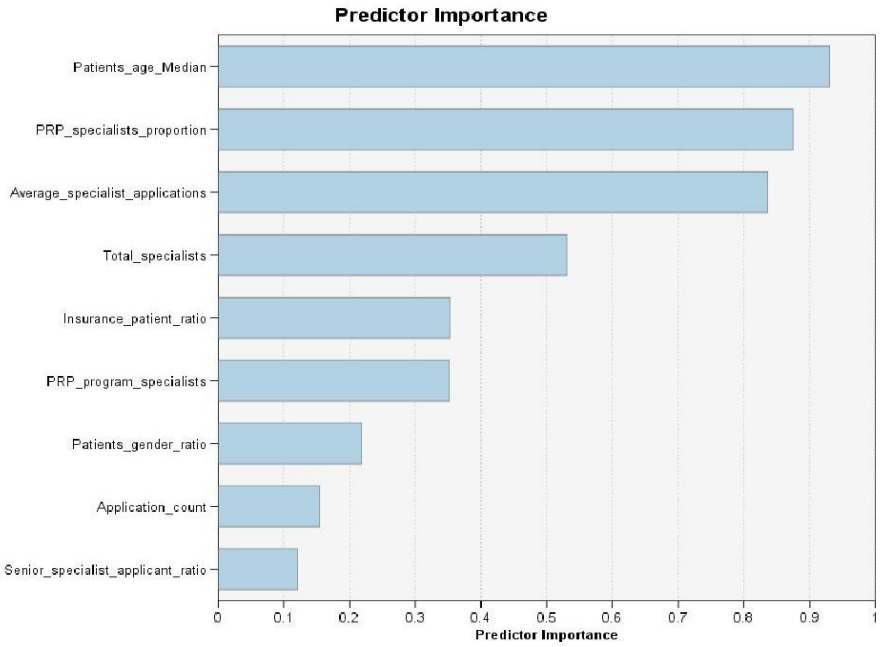

Figure S2. Result of Predictor Importance Through RF Analysis