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Territorially Adaptive Organisation of Geriatric Care in a Post-Soviet Primary Care System: A Controlled Evaluation in the Samarkand Region of Uzbekistan

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ABSTRACT:

Background. Populations are ageing rapidly across Central Asia, but the primary care systems inherited from the Soviet period were built around episodic attendance rather than continuous, coordinated follow-up. No controlled evaluation of an organisational model of care for older people has been reported from the region. We evaluated a territorially adaptive organisational model of geriatric care in the Samarkand region of Uzbekistan.

Methods. A controlled, non-randomised (quasi-experimental) study was conducted in six territories of the Samarkand region spanning urban, peri-urban, foothill, agricultural-plain and remote settings, between 2020 and 2025. Six hundred residents aged 60 years and over were allocated to an intervention group ($n = 320$), managed under the adaptive model, or to a control group ($n = 280$), receiving usual care; 180 health workers and 30 experts were surveyed. The model comprised an initial organisational–medical assessment, three-level risk stratification, an individual follow-up plan, a standardised routing algorithm with documented referral and mandatory written feedback to primary care, and monitoring of adherence. Forty process, access, continuity, clinical, social and resource indicators were compared using the chi-square test; risk ratios with 95% confidence intervals were calculated.

Results. At baseline, 63.7% of the cohort had no individual follow-up plan, 60.7% received no feedback from specialists into primary care, and 45.2% waited more than seven days for a specialist. Territorial gradients were steep for transport difficulty (18.3% in the regional centre vs 49.0% in the most remote district, $p < 0.001$) and for dissatisfaction (31.7% vs 54.0%, $p = 0.032$), but absent for specialist waiting time ($p = 0.163$). After implementation, the intervention group exceeded the control group on every indicator. The largest gains were in rule-governed components: an individual plan was formulated for 92.5% versus 37.1% (risk ratio 2.49, 95% CI 2.13–2.91) and adherence was monitored in 88.1% versus 34.3% (RR 2.57, 2.17–3.04). Gains were smaller for capacity-governed

components, notably home visiting (33.8% vs 15.4%) and transport difficulty (22.5% vs 34.3%, RR 0.66, 0.51–0.85). Unjustified attendance at specialist level fell from 24.3% to 9.4% and hospitalisation for deterioration from 16.8% to 8.8% (RR 0.52, 0.34–0.81, $p = 0.004$). Overall effectiveness was rated high in 63.8% versus 20.7% ($p < 0.001$).

Conclusions. An organisational model requiring no additional clinical technology substantially improved the structure, continuity and perceived quality of care for older people in a post-Soviet primary care system, and reduced hospitalisation for deterioration. The pattern of effect indicates where such redesign works and where it reaches its ceiling: what can be specified as a rule changed markedly, whereas what depends on physical capacity — home visiting and transport — changed least. Specialist waiting time improved not by adding supply but by removing unnecessary demand.



Graphical abstract. The problem, the model and the result, with the central finding: what can be written as a rule changed markedly, what depends on physical capacity changed least.

1. BACKGROUND

The United Nations Decade of Healthy Ageing has made the reorganisation of health services around older people an explicit global priority, and the World Health Organization's Integrated Care for Older People (ICOPE) framework has become its principal operational expression [1–3]. ICOPE has now been adopted, piloted or evaluated in a wide range of settings, including China, Hong Kong, Malaysia, Pakistan, Greece, and several African countries [4–12], and a growing body of evidence supports comprehensive geriatric assessment and integrated care for community-dwelling older adults [13–18].

Central Asia is largely absent from this literature. Searches of the indexed literature identify only a small number of papers on the health of older people in the region — chiefly from Kazakhstan, where the EASYCare instrument has been localised and informal caregiving described [19,20], a comparative analysis of older people's health across five Central Asian states during the COVID-19 pandemic [21], an early study of correlates of health in an Uzbek population [22], and a recent account of geriatric

care in traditional Central Asian communities [23]. To our knowledge no controlled evaluation of an organisational model of care for older people has been published from the region.

This matters because the starting point differs from the settings in which integrated care models were developed. The primary care systems of the former Soviet Union were organised around the polyclinic: a facility-centred, specialist-dense structure designed for episodic attendance and vertical referral rather than for longitudinal, coordinated follow-up of a person with several chronic conditions [24–26]. Post-independence reforms introduced family medicine, but the underlying architecture — and with it the absence of a named individual plan, of documented two-way referral, and of routine verification that recommendations were acted upon — has proved durable. Models validated in settings with established general practice and functioning care coordination cannot simply be transplanted onto that architecture.

Geography compounds the problem. Older people in rural and remote areas of low- and middle-income countries face well-documented barriers of distance, transport and dependence on relatives for accompaniment [27–30]. The Samarkand region, the most populous province of Uzbekistan, contains within a single administrative unit an urban regional centre, peri-urban districts, foothill terrain, agricultural plain and a large, sparsely populated remote district — a natural gradient against which a territorially adaptive model can be tested.

We therefore developed and evaluated an adaptive organisational–managerial model of geriatric care designed for this architecture: one that adds no clinical technology and no new specialty, and works only by changing how existing primary care is organised. The objectives were to characterise the baseline organisation of care for older people across territories of differing accessibility; and to compare organisational, access, continuity, clinical, social and resource outcomes between patients managed under the model and patients receiving usual care.

2. METHODS

2.1 *Design and setting*

This was a controlled, non-randomised (quasi-experimental) study with a descriptive baseline phase, conducted between 2020 and 2025 in the Samarkand region of Uzbekistan. Six territories were included, selected to span the accessibility gradient of the region: the city of Samarkand (urban regional centre), Samarkand district (peri-urban), Kattakurgan district and town (remote urban–rural), Urgut district (foothill), Pastdargom district (agricultural plain) and Nurabad district (remote, low population density, large area). Participating facilities were family polyclinics and district medical associations; no facilities outside the Samarkand region were included. The study proceeded in five stages: methodological preparation; collection of routine statistical and documentary material; assessment of the existing organisation of care through patient, health-worker and expert surveys; development of the model; and comparative evaluation of its effects.

2.2 *Participants*

Six hundred residents aged 60 years and over were enrolled. Inclusion criteria were: age 60 years or older; permanent residence in the Samarkand region; receipt of care or dispensary follow-up at a participating facility; availability of outpatient medical documentation; ability to provide the required information from records and/or interview; and voluntary consent to be interviewed. Exclusion criteria were: age under 60; non-permanent residence; incomplete or unreliable documentation; refusal to participate; severe general condition, marked cognitive impairment or other circumstances precluding participation in the interview; and receipt of care predominantly outside the participating facilities. Participants were allocated to an intervention group ($n = 320$) or a control group ($n = 280$). Allocation was not randomised. Groups were compared at baseline on sex, age band, urban or rural residence, former occupation and enrolling territory, and did not differ significantly on any of these (Table 1); the distribution across enrolling territories was closely matched ($p = 0.999$). In parallel, 180 health workers (96 from intervention-group facilities, 84 from control-group facilities) were surveyed: 60 family physicians or general practitioners, 40 specialist physicians, 60 nurses and 20 health-service managers. An expert panel of 30 was convened, comprising 10 health-service organisers, 8 heads of primary care institutions and district medical associations, 8 physicians experienced in the care of older patients and 4 specialists in public health or medical statistics.

2.3 *Baseline assessment*

The baseline phase characterised the whole cohort ($n = 600$) using routine statistical reporting, review of outpatient records, and structured interviews covering the level at which care was obtained, the presence of a designated family physician, dispensary

follow-up, the existence of an individual follow-up plan, waiting times, transport and accompaniment, referral practice, feedback from specialists, and satisfaction. Health workers and experts rated organisational problems and proposed priorities; experts scored each problem on a five-point scale.

2.4 The intervention

The adaptive organisational–managerial model rests on five principles: territorial adaptability; patient-centred individualisation; standardised routing and continuity; a risk-oriented and preventive approach; and monitoring with interdisciplinary coordination. Operationally it is a six-step pathway.

First, case identification — through attendance, dispensary registration, home visiting or active case finding. Second, an initial organisational–medical assessment covering clinical status, chronic conditions, mobility, need for accompaniment, transport accessibility and capacity for independent attendance. Third, stratification into three levels of organisational–medical risk: low (stable, mobile, infrequent attendance) managed by routine family-physician follow-up and preventive counselling; intermediate (chronic conditions, periodic specialist need, moderate access difficulty) managed by an individual plan with scheduled consultations; and high or very high (multimorbidity, frequent attendance, limited mobility, need for accompaniment, remote residence) managed by active dispensary follow-up, planned specialist routing, home care and verified adherence. Fourth, formulation of a written individual follow-up plan specifying the timing of reviews, consultations, preventive measures and home visits. Fifth, routing to the next level with the purpose and timing of the consultation documented, and written feedback returned to primary care. Sixth, monitoring of adherence with revision of the plan as required.

The control group received usual care: the pre-existing organisation of geriatric services, without structured initial assessment, risk stratification, individual planning or mandated feedback.

2.5 Outcome indicators

Forty indicators were specified across six domains: process of care (eight indicators), access (seven), continuity and routing (seven), clinical–organisational outcomes (seven), patient-reported and social outcomes (seven), and resource-related indicators (four). For each domain, patients were additionally classified as showing a high, intermediate or low level of the corresponding attribute, and a composite level of overall effectiveness was derived. Indicator data were obtained from medical documentation and structured patient interview.

2.6 Statistical analysis

Categorical variables are reported as counts and percentages. Between-group comparisons used the Pearson chi-square test with Yates' continuity correction for 2×2 tables. Risk ratios are presented with 95% confidence intervals calculated on the log scale, and absolute differences in percentage points with 95% confidence intervals by the normal approximation. Two-sided p values below 0.05 were considered significant. No adjustment was made for multiple comparisons; given the number of indicators, p values should be read as descriptive rather than as formal hypothesis tests, and the confidence intervals interpreted accordingly. Analyses were performed in IBM SPSS Statistics and verified independently in Python (SciPy).

2.7 Ethics

The study was approved by the Ethics Committee of Samarkand State Medical University (protocol No. [to be inserted], [date]). All participants gave voluntary informed consent to be interviewed. Data were analysed in de-identified form.

3. RESULTS

3.1 Participants

Of the 600 participants, 348 (58.0%) were women and 252 (42.0%) men; 360 (60.0%) were aged 60–74 years, 216 (36.0%) 75–89 years and 24 (4.0%) 90 years or older. Rural residents accounted for 340 (56.7%). The intervention and control groups were comparable across all baseline characteristics (Table 1); the flow of participants is shown in Figure 1.

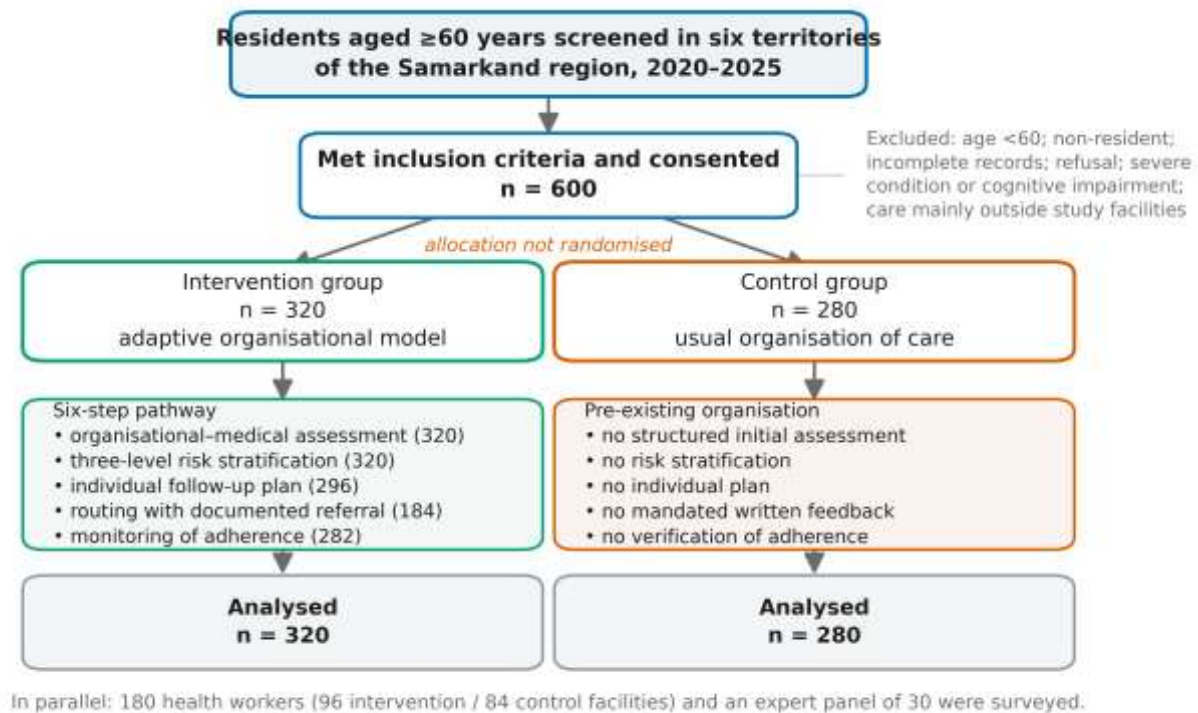


Figure 1. Flow of participants. Six hundred residents aged 60 years and over met the inclusion criteria and consented. Allocation to the intervention or control group was not randomised. In parallel, 180 health workers and an expert panel of 30 were surveyed.

Table 1. Baseline characteristics of the study groups

Characteristic	Intervention (n = 320)	Control (n = 280)	Total (n = 600)	p
Women	184 (57.5%)	164 (58.6%)	348 (58.0%)	>0.05
Men	136 (42.5%)	116 (41.4%)	252 (42.0%)	
Aged 60–74 years	194 (60.6%)	166 (59.3%)	360 (60.0%)	>0.05
Aged 75–89 years	114 (35.6%)	102 (36.4%)	216 (36.0%)	
Aged ≥90 years	12 (3.8%)	12 (4.3%)	24 (4.0%)	
Urban residence	140 (43.8%)	120 (42.9%)	260 (43.3%)	>0.05
Rural residence	180 (56.2%)	160 (57.1%)	340 (56.7%)	
Samarkand city	65 (20.3%)	55 (19.6%)	120 (20.0%)	0.999
Samarkand district	48 (15.0%)	42 (15.0%)	90 (15.0%)	
Kattakurgan district / town	48 (15.0%)	42 (15.0%)	90 (15.0%)	
Urgut district	53 (16.6%)	47 (16.8%)	100 (16.7%)	

Characteristic	Intervention (n = 320)	Control (n = 280)	Total (n = 600)	p
Pastdargom district	53 (16.6%)	47 (16.8%)	100 (16.7%)	
Nurabad district	53 (16.6%)	47 (16.8%)	100 (16.7%)	

3.2 Baseline organisation of care

At baseline, 553 participants (92.2%) had a designated family physician, but only 284 (47.3%) were under regular dispensary follow-up and 382 (63.7%) had no individual follow-up plan. Care was obtained at primary level by 536 (89.3%), at district or specialist level by 381 (63.5%), at regional specialist level by 180 (30.0%) and as inpatient care by 146 (24.3%).

Access was constrained in characteristic ways. Reaching a primary care facility took more than 30 minutes for 199 (33.2%) participants, and more than an hour for 57 (9.5%). Only 335 (55.8%) could make an appointment without help; 319 (53.2%) required a relative to accompany them; 271 (45.2%) waited more than seven days for a specialist; and 143 (23.8%) had delayed seeking care because of access difficulty.

Continuity was the weakest domain. Although 384 (64.0%) attended a specialist with a referral from the family physician, only 328 (54.7%) had that referral documented, only 236 (39.3%) generated written feedback into primary care, and only 244 (40.7%) had the onward route explained to them or their relatives. Repeat attendance attributable to incomplete routing affected 185 (30.8%). Overall, 248 (41.3%) were partially satisfied or dissatisfied with their care (Table 2).

Table 2. Baseline organisation of care in the whole cohort (n = 600)

Indicator	n	%
Designated family physician	553	92.2
Regular dispensary follow-up	284	47.3
No individual follow-up plan	382	63.7
Difficulty booking a specialist appointment	261	43.5
Inadequately informed about preventive measures	352	58.7
Able to book an appointment unaided	335	55.8
Requires a relative to accompany them	319	53.2
Waits >7 days for a specialist	271	45.2
Transport difficulty in reaching care	200	33.3
Care-seeking delayed by access difficulty	143	23.8
Referral documented in the record	328	54.7
Written feedback returned to primary care	236	39.3
Onward route explained to patient or relatives	244	40.7
Repeat attendance due to incomplete routing	185	30.8
Partially satisfied or dissatisfied with care	248	41.3

3.3 The territorial gradient

Baseline problems were not evenly distributed (Table 3, Figure 2). Transport difficulty rose from 18.3% in the regional centre to 49.0% in the most remote district ($p < 0.001$); delayed care-seeking from 15.0% to 33.0% ($p = 0.048$); absence of feedback from specialists from 47.5% to 71.0% ($p = 0.003$); an unexplained onward route from 45.0% to 71.0% ($p = 0.002$); repeat attendance from 20.0% to 40.0% ($p = 0.018$); and dissatisfaction from 31.7% to 54.0% ($p = 0.032$).

One indicator behaved differently. Waiting more than seven days for a specialist showed no significant territorial variation (35.8% to 54.0%, $p = 0.163$). Unlike transport or continuity, specialist waiting time was poor everywhere, including in the regional centre where specialists are concentrated. This distinguishes a problem of geography from a problem of system capacity and demand, and the two require different remedies.

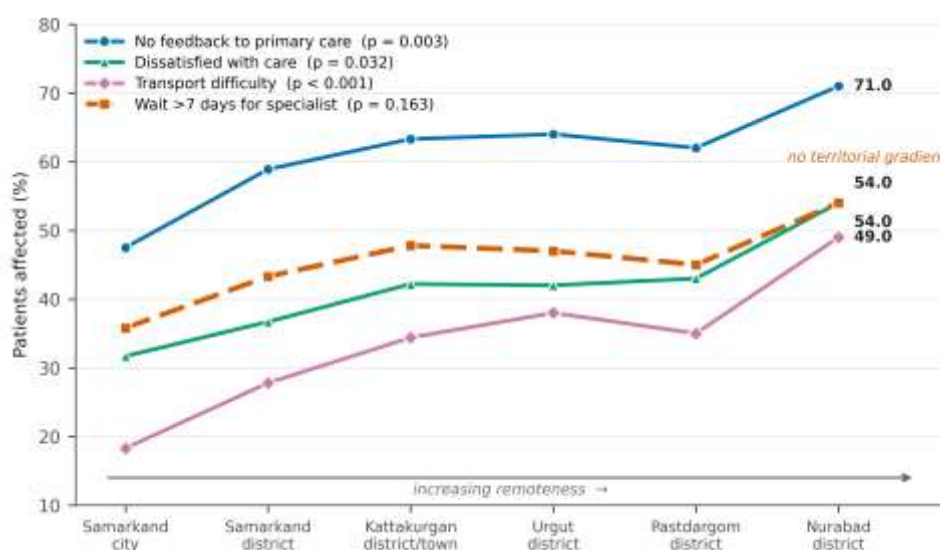


Figure 2. Baseline indicators by territory, ordered by increasing remoteness. Transport difficulty, absence of written feedback into primary care and dissatisfaction all rise monotonically with remoteness. Waiting more than seven days for a specialist (dashed line) shows no significant territorial variation ($p = 0.163$): it is equally poor in the regional centre, where specialists are concentrated. p values are for the chi-square test across the six territories.

Table 3. Territorial gradient in baseline indicators

Territory	n	Transport difficulty	Wait >7 days for specialist	No feedback to PHC	Dissatisfied
Samarkand city (urban centre)	120	22 (18.3%)	43 (35.8%)	57 (47.5%)	38 (31.7%)
Samarkand district (peri-urban)	90	25 (27.8%)	39 (43.3%)	53 (58.9%)	33 (36.7%)
Kattakurgan district / town	90	31 (34.4%)	43 (47.8%)	57 (63.3%)	38 (42.2%)
Urgut district (foothill)	100	38 (38.0%)	47 (47.0%)	64 (64.0%)	42 (42.0%)
Pastdargom district (plain)	100	35 (35.0%)	45 (45.0%)	62 (62.0%)	43 (43.0%)
Nurabad district (remote)	100	49 (49.0%)	54 (54.0%)	71 (71.0%)	54 (54.0%)

Territory	n	Transport difficulty	Wait >7 days for specialist	No feedback to PHC	Dissatisfied
Total	600	200 (33.3%)	271 (45.2%)	364 (60.7%)	248 (41.3%)
p		<0.001	0.163	0.003	0.032

3.4 Views of health workers and experts

Among the 180 health workers surveyed, the most frequently identified problems were the absence of a single routing algorithm for older patients (76.7%), insufficient preparation in geriatric care (68.9%), insufficient time for individual work with older patients (65.6%) and weak continuity between levels of care (62.2%). Their leading proposals were a single routing algorithm (84.4%), individual follow-up plans (81.7%) and a register of high-risk patients (78.3%).

The expert panel ranked the same problems highest: absence of a routing algorithm (mean 4.7 ± 0.2 ; rated highly significant by 93.3%), insufficient continuity between levels (4.6 ± 0.3 ; 90.0%) and absence of individual follow-up plans (4.5 ± 0.3 ; 86.7%). The model was designed against these priorities; its structure is summarised in Figure 3.



Figure 3. The adaptive organisational model. The upper panel shows the six-step pathway, with re-entry when a patient's status changes. The lower panel details step 3, the three levels of organisational-medical risk, with the criteria defining each level and the organisational tactic that follows from it. The model adds no clinical technology, no new facility and no new specialty.

3.5 Delivery of the model

All 320 patients in the intervention group underwent the initial organisational-medical assessment and risk stratification. An individual plan was formulated for 296 (92.5%), preventive counselling delivered to 304 (95.0%), adherence monitored in 282 (88.1%) and relatives counselled for 246 (76.9%). Planned specialist routing was undertaken for 184 (57.5%), with written

feedback received in 166 (51.9%). One hundred and two patients (31.9%) were entered in the high-risk register and 108 (33.8%) received home visiting or patronage.

3.6 Comparative outcomes

The intervention group performed better than the control group on all 40 indicators (Table 4, Figure 4). In the process domain, an individual plan was formulated for 92.5% versus 37.1% (risk ratio 2.49, 95% CI 2.13–2.91) and adherence was monitored in 88.1% versus 34.3% (RR 2.57, 2.17–3.04).

In the access domain, 85.6% versus 57.1% could book unaided (RR 1.50, 1.34–1.67); waiting more than seven days for a specialist fell to 22.5% from 46.4% (RR 0.48, 0.38–0.62); and home care was available when needed to 67.5% versus 30.7% (RR 2.20, 1.81–2.66). Transport difficulty showed the smallest relative change of any indicator (22.5% vs 34.3%; RR 0.66, 0.51–0.85).

Continuity improved markedly: written feedback reached primary care for 51.9% versus 19.3% (RR 2.69, 2.07–3.49); the onward route was explained to 85.0% versus 41.4% (RR 2.05, 1.77–2.38); and referral without a stated time or place fell to 10.6% from 29.3% (RR 0.36, 0.25–0.52).

Among clinical–organisational outcomes, chronic conditions were regularly reviewed in 78.1% versus 43.2% (RR 1.81, 1.56–2.09), unplanned repeat visits fell to 11.9% from 27.9% (RR 0.43, 0.30–0.61), and hospitalisation for deterioration fell to 8.8% from 16.8% (RR 0.52, 0.34–0.81, $p = 0.004$).

Patient-reported outcomes followed: 83.1% versus 57.1% were fully or mostly satisfied, 83.8% versus 40.0% understood their own onward route, and 61.9% versus 28.6% reported reduced dependence on relatives. Resource-related indicators showed a consistent reduction in avoidable activity: self-referral to specialist level without primary care assessment fell to 11.2% from 30.0% and unjustified attendance at specialist level to 9.4% from 24.3%.

Table 4. Outcomes after implementation of the model

Indicator	Intervention (n = 320)	Control (n = 280)	Difference, pp (95% CI)	Risk ratio (95% CI)	p
Process of care					
Initial organisational–medical assessment	320 (100.0%)	148 (52.9%)	+47.1 (41.3 to 53.0)	1.89 (1.69–2.11)	<0.001
Individual follow-up plan formulated	296 (92.5%)	104 (37.1%)	+55.4 (49.0 to 61.7)	2.49 (2.13–2.91)	<0.001
Regular dispensary follow-up	278 (86.9%)	132 (47.1%)	+39.7 (32.8 to 46.7)	1.84 (1.62–2.10)	<0.001
Entered in high-risk register	102 (31.9%)	20 (7.1%)	+24.7 (18.8 to 30.7)	4.46 (2.84–7.01)	<0.001
Adherence to recommendations monitored	282 (88.1%)	96 (34.3%)	+53.8 (47.2 to 60.4)	2.57 (2.17–3.04)	<0.001
Preventive counselling delivered	304 (95.0%)	126 (45.0%)	+50.0 (43.7 to 56.3)	2.11 (1.85–2.41)	<0.001
Relatives counselled on care	246 (76.9%)	82 (29.3%)	+47.6 (40.5 to 54.6)	2.62 (2.17–3.18)	<0.001

Indicator	Intervention (n = 320)	Control (n = 280)	Difference, pp (95% CI)	Risk ratio (95% CI)	p
Home visiting / patronage organised	108 (33.8%)	43 (15.4%)	+18.4 (11.7 to 25.1)	2.20 (1.60–3.01)	<0.001
Access					
Able to book an appointment unaided	274 (85.6%)	160 (57.1%)	+28.5 (21.5 to 35.4)	1.50 (1.34–1.67)	<0.001
Wait >1 day for family physician	58 (18.1%)	116 (41.4%)	–23.3 (–30.5 to –16.2)	0.44 (0.33–0.57)	<0.001
Wait >7 days for specialist	72 (22.5%)	130 (46.4%)	–23.9 (–31.3 to –16.5)	0.48 (0.38–0.62)	<0.001
Transport difficulty in reaching care	72 (22.5%)	96 (34.3%)	–11.8 (–19.0 to –4.6)	0.66 (0.51–0.85)	0.002
Requires accompaniment by a relative	112 (35.0%)	151 (53.9%)	–18.9 (–26.8 to –11.1)	0.65 (0.54–0.78)	<0.001
Care-seeking delayed by access difficulty	36 (11.2%)	70 (25.0%)	–13.8 (–19.9 to –7.6)	0.45 (0.31–0.65)	<0.001
Home care available when needed	216 (67.5%)	86 (30.7%)	+36.8 (29.3 to 44.2)	2.20 (1.81–2.66)	<0.001
Continuity and routing					
Referred according to routing algorithm	184 (57.5%)	118 (42.1%)	+15.4 (7.4 to 23.3)	1.36 (1.16–1.61)	<0.001
Referral documented in the record	178 (55.6%)	94 (33.6%)	+22.1 (14.3 to 29.8)	1.66 (1.37–2.01)	<0.001
Written feedback returned to primary care	166 (51.9%)	54 (19.3%)	+32.6 (25.4 to 39.8)	2.69 (2.07–3.49)	<0.001
Onward route explained to patient/relatives	272 (85.0%)	116 (41.4%)	+43.6 (36.6 to 50.5)	2.05 (1.77–2.38)	<0.001
Post-consultation follow-up verified	158 (49.4%)	52 (18.6%)	+30.8 (23.7 to 37.9)	2.66 (2.03–3.48)	<0.001
Repeat attendance due to incomplete routing	42 (13.1%)	92 (32.9%)	–19.7 (–26.4 to –13.1)	0.40 (0.29–0.55)	<0.001
Referral without stated time or place	34 (10.6%)	82 (29.3%)	–18.7 (–25.0 to –12.4)	0.36 (0.25–0.52)	<0.001

Indicator	Intervention (n = 320)	Control (n = 280)	Difference, pp (95% CI)	Risk ratio (95% CI)	p
Clinical–organisational outcomes					
Chronic conditions regularly reviewed	250 (78.1%)	121 (43.2%)	+34.9 (27.5 to 42.3)	1.81 (1.56–2.09)	<0.001
Coverage by preventive counselling	268 (83.8%)	126 (45.0%)	+38.8 (31.7 to 45.8)	1.86 (1.61–2.16)	<0.001
Timely specialist consultation when indicated	164 (51.2%)	82 (29.3%)	+22.0 (14.3 to 29.6)	1.75 (1.42–2.16)	<0.001
Recommendations carried out under PHC control	246 (76.9%)	118 (42.1%)	+34.7 (27.3 to 42.1)	1.82 (1.57–2.12)	<0.001
Repeat attendance for exacerbation	44 (13.8%)	72 (25.7%)	–12.0 (–18.3 to –5.6)	0.53 (0.38–0.75)	<0.001
Unplanned repeat visit	38 (11.9%)	78 (27.9%)	–16.0 (–22.3 to –9.6)	0.43 (0.30–0.61)	<0.001
Hospitalisation for deterioration	28 (8.8%)	47 (16.8%)	–8.0 (–13.4 to –2.7)	0.52 (0.34–0.81)	0.004
Patient-reported and social outcomes					
Fully or mostly satisfied with care	266 (83.1%)	160 (57.1%)	+26.0 (18.9 to 33.1)	1.45 (1.30–1.63)	<0.001
Adequately informed about prevention	272 (85.0%)	118 (42.1%)	+42.9 (35.9 to 49.8)	2.02 (1.75–2.33)	<0.001
Understands own onward care route	268 (83.8%)	112 (40.0%)	+43.8 (36.7 to 50.8)	2.09 (1.80–2.44)	<0.001
Satisfied with access to family physician	276 (86.2%)	166 (59.3%)	+27.0 (20.1 to 33.8)	1.45 (1.31–1.62)	<0.001
Satisfied with access to specialist	218 (68.1%)	98 (35.0%)	+33.1 (25.6 to 40.7)	1.95 (1.63–2.32)	<0.001
Reduced dependence on relatives	198 (61.9%)	80 (28.6%)	+33.3 (25.8 to 40.8)	2.17 (1.77–2.66)	<0.001
Confident care will arrive in time	254 (79.4%)	125 (44.6%)	+34.7 (27.4 to 42.1)	1.78 (1.54–2.05)	<0.001
Resource-related indicators					

Indicator	Intervention (n = 320)	Control (n = 280)	Difference, pp (95% CI)	Risk ratio (95% CI)	p
Self-referral without primary care assessment	36 (11.2%)	84 (30.0%)	-18.8 (-25.1 to -12.4)	0.38 (0.26–0.54)	<0.001
Unjustified attendance at specialist level	30 (9.4%)	68 (24.3%)	-14.9 (-20.9 to -9.0)	0.39 (0.26–0.58)	<0.001
Repeat consultation due to poor documentation	26 (8.1%)	61 (21.8%)	-13.7 (-19.3 to -8.0)	0.37 (0.24–0.57)	<0.001
Scheduled follow-up deadline missed	40 (12.5%)	96 (34.3%)	-21.8 (-28.4 to -15.1)	0.36 (0.26–0.51)	<0.001

pp = percentage points. Risk ratios above 1 indicate a higher proportion in the intervention group; for adverse indicators a ratio below 1 indicates benefit. p values are from the chi-square test with continuity correction and are not adjusted for multiple comparisons.

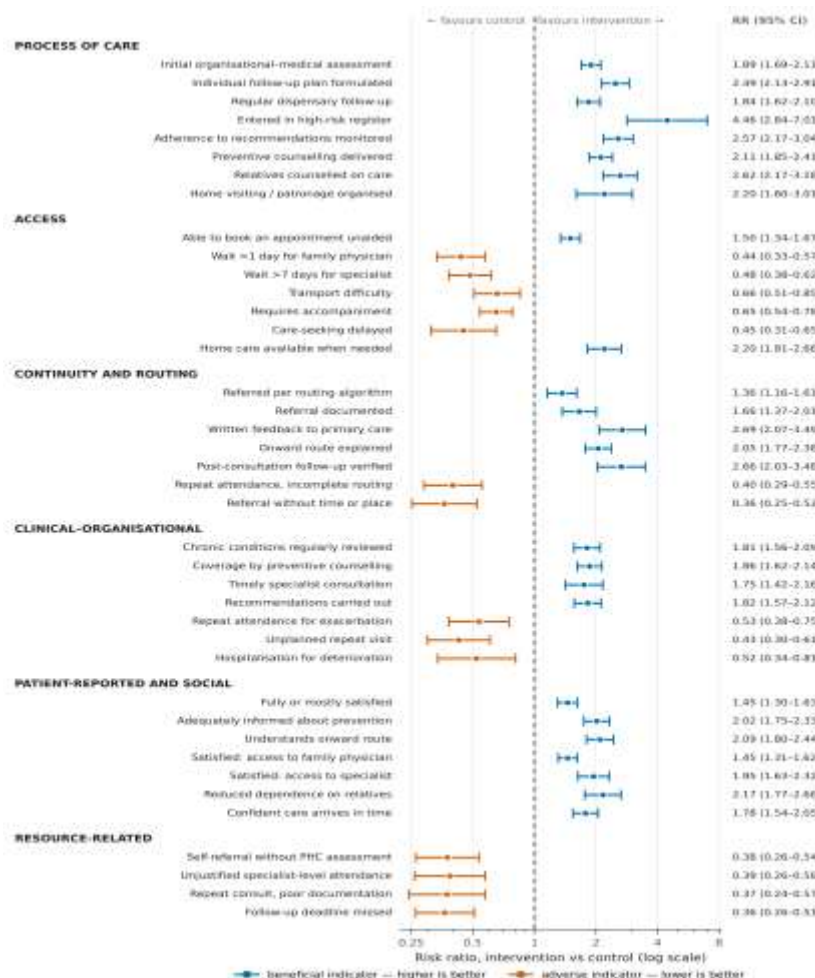


Figure 4. Risk ratios with 95% confidence intervals for all 40 indicators, grouped by domain. Blue denotes beneficial indicators, for which a ratio above 1 favours the intervention; orange denotes adverse indicators, for which a ratio below 1 favours the intervention. The vertical dashed line marks the null. The scale is logarithmic. p values are not adjusted for multiple comparisons.

3.7 Composite effectiveness

Classified by domain, a high level was achieved by a substantially greater proportion of the intervention group across all six domains, and overall effectiveness was rated high in 204 (63.8%) versus 58 (20.7%), with a low level in 22 (6.9%) versus 100 (35.7%) ($p < 0.001$; Tables 5 and 6, Figure 5).

Table 5. Proportion achieving a high level, by domain

Domain	Intervention (n = 320)	Control (n = 280)	p
Organisation of care	218 (68.1%)	64 (22.9%)	<0.001
Accessibility of care	210 (65.6%)	72 (25.7%)	<0.001
Continuity of care	196 (61.3%)	58 (20.7%)	<0.001
Clinical–organisational effectiveness	202 (63.1%)	52 (18.6%)	<0.001
Social effectiveness	210 (65.6%)	66 (23.6%)	<0.001
Resource-related effectiveness	206 (64.4%)	58 (20.7%)	<0.001

Table 6. Composite level of overall effectiveness

Level	Intervention (n = 320)	Control (n = 280)	p
High	204 (63.8%)	58 (20.7%)	<0.001
Intermediate	94 (29.4%)	122 (43.6%)	
Low	22 (6.9%)	100 (35.7%)	

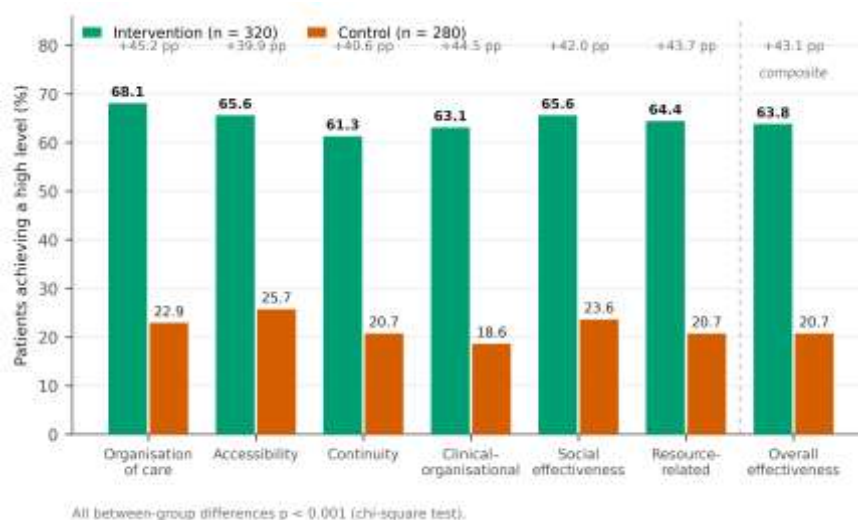


Figure 5. Proportion of patients achieving a high level in each domain of effectiveness, and in the composite measure. All between-group differences $p < 0.001$ (chi-square test).

4. DISCUSSION

4.1 Principal findings

A purely organisational intervention — no new drug, device, facility or specialty — produced large, consistent improvements across every measured domain of geriatric care in a post-Soviet regional health system, and was associated with a halving of hospitalisation for deterioration. The baseline data establish why the scope for such an intervention was so wide: nine in ten older people had a designated family physician, yet fewer than half were under regular follow-up, fewer than four in ten generated any written feedback from a specialist back into primary care, and six in ten had no individual plan. The structure of care existed; the connections between its parts did not.

4.2 Where organisational redesign works, and where it stops

The most useful finding for other systems is not that the model worked but the shape of its effect. Components that can be specified as a rule — conduct an assessment, write a plan, document the referral, return written feedback, verify that recommendations were followed, explain the route to the patient — improved by around 40 to 55 percentage points. Components that depend on physical capacity improved far less: home visiting reached only 33.8% of the intervention group, and transport difficulty showed the smallest relative change of all 40 indicators (RR 0.66). No organisational rule creates a vehicle or a nurse with time to travel. Figure 6 shows this separation across the components of care delivery.

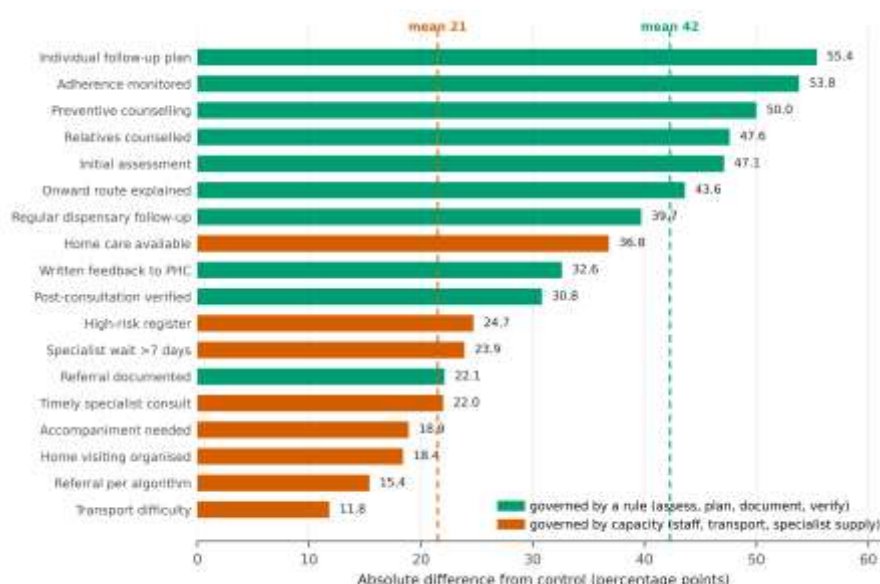


Figure 6. Absolute difference from control, in percentage points, for the components of care delivery, ordered by magnitude.

Green denotes components that can be specified as a rule — conduct an assessment, write a plan, document the referral, return written feedback, verify adherence. Orange denotes components that depend on physical capacity — staff time for home visiting, transport, specialist supply. Dashed lines mark the mean of each group. Downstream clinical, social and resource outcomes are not shown, since they are consequences of these components rather than components themselves.

One apparent exception clarifies the principle rather than contradicting it. Specialist waiting time, a capacity-governed indicator, improved substantially (46.4% to 22.5% waiting more than seven days). The mechanism is visible in the resource indicators: self-referral without primary care assessment fell from 30.0% to 11.2% and unjustified attendance at specialist level from 24.3% to 9.4%. Waiting improved because demand was filtered, not because supply was increased. For systems that cannot expand their specialist workforce in the short term — the situation across much of Central Asia — this is the practically important result: gatekeeping performed properly is itself a capacity intervention.

4.3 What the territorial gradient does and does not explain

Baseline problems increased monotonically with remoteness for transport, continuity and satisfaction, confirming in a Central Asian setting the access barriers documented for rural older people elsewhere [27–30]. But specialist waiting time did not vary

by territory ($p = 0.163$): it was equally poor in the regional centre, where specialists are concentrated, as in the remote district. This separates two problems that are often merged under the heading of access. Distance-related barriers require territorially differentiated solutions — home visiting, outreach, transport support. Waiting time is a system-level problem of demand management that territorial adaptation cannot touch, and that our data suggest responds to referral discipline. Designing a single "access" intervention for both would fail on one of them.

4.4 Relation to international models

The model is convergent with, but not derived from, the WHO ICOPE framework [1–3]. Both centre on structured assessment, an individualised care plan and coordinated follow-up. The differences reflect the starting architecture. ICOPE is built around intrinsic capacity and its domains, and presumes a service able to act on them; the present model is built around organisational risk — mobility, need for accompaniment, transport accessibility, capacity to attend independently — because in this setting the dominant determinant of whether an older person receives care is not the measurable decline in their capacity but whether the system can route them and follow them up. Where ICOPE implementation studies report that the principal obstacles are workforce, financing and information systems [4–8], our findings are consistent: the elements requiring those resources moved least. The magnitude of effect is larger than that typically reported from comprehensive geriatric assessment and integrated care trials in high-income settings [13–18,31–33]. This is unlikely to indicate a superior intervention. It is more plausibly a function of the baseline: where 37% of the comparison group has an individual plan, the room for improvement in that indicator is far greater than in a system where structured planning is already routine. Effect sizes of this kind are a property of the gap being closed, not of the instrument closing it, and the comparison with European quasi-experimental evaluations of integrated care [31,32] should be read in that light.

4.5 Implications

Three implications follow for comparable systems. First, the highest-yield first step is not new services but documentation discipline: a written plan, a documented referral with stated purpose and timing, mandatory written feedback, and verification of adherence. These cost little and produced the largest effects here. Second, referral discipline should be presented to decision-makers as a capacity measure, since it shortened specialist waiting without additional specialists. Third, a territorially adaptive design is necessary but not sufficient: it addresses distance-related barriers, and the residual transport and home-visiting deficits define where additional resource, rather than additional organisation, is required.

4.6 Limitations

Several limitations must be stated plainly, and they bound the strength of the conclusions.

First, and most important, allocation was not randomised and the method by which patients entered the intervention or control group is not specified. The groups were closely comparable on measured characteristics, including a near-identical distribution across enrolling territories, but comparability on measured variables does not exclude selection on unmeasured ones — for example, on the motivation of the patient or of the treating physician. The design is quasi-experimental and the findings are associations, not unbiased causal estimates. Second, because both groups were drawn from the same six territories and, apparently, from the same facilities, contamination is likely: clinicians trained to work under the new model would be expected to change their practice for control patients as well. Contamination would bias the comparison towards the null, so the true effect may be larger than estimated; but it also means the two arms are not cleanly independent. Third, most outcomes are process indicators and patient-reported measures, obtained without blinding of patients, clinicians or assessors. Patients aware of receiving enhanced attention may report greater satisfaction and confidence irrespective of any change in care. The single outcome least vulnerable to this — hospitalisation for deterioration — showed the smallest effect (RR 0.52) and the largest p value (0.004), which is the expected pattern and should temper enthusiasm about the larger figures.

Fourth, 40 indicators were compared without adjustment for multiplicity. Given the consistency and magnitude of the differences this is unlikely to alter the overall conclusion, but individual p values should be read descriptively.

Fifth, no time-to-event or cost analysis was performed; "resource-related" indicators are counts of avoidable activity, not costs. Sixth, the study was conducted in a single region, and although that region spans a wide accessibility gradient, generalisation to other provinces of Uzbekistan or to other Central Asian states remains to be demonstrated. Finally, the follow-up period over which outcomes were ascertained is not separately specified, so persistence of effect cannot be assessed.

5. CONCLUSIONS

In a region of Uzbekistan spanning urban, peri-urban, foothill, agricultural and remote territories, an adaptive organisational model of geriatric care — structured assessment, three-level risk stratification, an individual follow-up plan, standardised routing with documented referral and mandatory feedback, and monitoring of adherence — was associated with substantially better organisation, access, continuity and patient-reported outcomes than usual care, and with halved hospitalisation for deterioration.

The distribution of effect is as informative as its size. What could be written as a rule changed greatly; what required physical capacity changed least; and the one capacity-limited indicator that did improve, specialist waiting time, did so because unnecessary demand was removed rather than because supply was added. For health systems in the region facing rapid population ageing without the means to expand their specialist workforce, that is the transferable finding. These are, to our knowledge, the first controlled data on the organisation of geriatric care published from Central Asia, and they should be confirmed in a randomised or stepped-wedge design with blinded outcome ascertainment.

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