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Evaluating Home Haemodialysis Caregiver Support & Nursing Contact Frequencies

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Abstract

Background: Home Haemodialysis (HHD) provides superior cardiovascular outcomes and survival compared to in-center therapy. However, domestic renal replacement therapy shifts substantial operational burden onto patients and unpaid family caregivers. Unscheduled clinical communications dominate community nursing workloads, driven primarily by secondary psychological distress and technique anxiety rather than primary mechanical failure. **Objectives:** To quantify operational communication triggers between HHD households and specialist community renal nursing teams, establishing an empirically anchored framework for digital positive psychology micro-interventions (Positive PKD) designed to cultivate patient activation and caregiver resilience. **Methods:** A 12-month retrospective audit of contact logs across regional HHD cohorts (N=84 dyads) was conducted alongside baseline assessment protocols using the Values in Action (VIA) Inventory of Strengths and Patient Activation Measure (PAM). Digital micro-learning modules (<=20 mins, 2-3 times/week during active dialysis) were structured under Seligman's PERMA model and Dweck's Growth Mindset theory. **Results & Conclusion:** Non-scheduled contacts accounted for 65.2% of total nursing workload, with caregiver distress/anxiety representing the single largest category (38.1%). Identifying core character strengths (Hope, Perseverance) and deploying intra-dialytic micro-interventions offers a feasible strategy to reduce acute panic calls, aligning with NHS 10 Year Health Plan objectives for community health integration.

Keywords: Home Haemodialysis (HHD), Patient Activation, Caregiver Burden, Positive Psychology, Digital Health Interventions, Patient and Public Involvement (PPI), Community Nursing, Renal Replacement Therapy

65.20%	38.10%	3.2x	<=20m
Unscheduled Nursing	Caregiver Distress	Unplanned Calls	Target App Session
Workload	Triggers	(Unassisted Dyads)	Duration

Introduction & Operational Context

Home Haemodialysis (HHD) is recognized globally as a high-efficacy treatment modality for end-stage renal disease (ESRD), delivering enhanced solute clearance, superior blood pressure management and improved quality of life. However, shifting complex renal replacement therapy into domestic settings places severe operational, physical, and emotional demands on patients and unpaid family caregivers.

Managing HHD requires mastering complex clinical routines: vascular access cannulation (buttonhole or rope-ladder), ultrafiltration rate calculations, systemic anticoagulation, and machine alarm troubleshooting. When technical challenges intersect with chronic exhaustion, caregiver burnout and technique failure spike.

Unplanned emergency contacts with NHS specialist renal units place considerable operational strain on community nursing staff. Integrating proactive clinical support with structured, self-administered digital micro-interventions offers a sustainable pathway to bolster HHD retention and alleviate healthcare system burden [1].

Clinical Nursing Contact Frequencies & Driver Audit

To evaluate community nursing operational load, a 12-month retrospective audit was performed analyzing communication logs across regional NHS HHD cohorts (N=84 patient-caregiver dyads). Communication events were categorized into four primary operational domains: routine clinical monitoring, urgent technical/machine alarms, vascular access distress calls, and acute caregiver anxiety/exhaustion episodes.

Contact Domain	Mean Freq.	Operational Triggers	Clinical & System Impact
Routine Audit	0.8 / mo	Scheduled blood panels, water purity testing, routine review	Low stress; predictable workload; baseline stability.
Technical Alarm	2.4 / mo	Air-lock, arterial pressure drop, conductivity faults	High acute panic; risks premature treatment termination.
Vascular Access	1.8 / mo	Cannulation failure, fistula bleeding, infiltration concern	Requires rapid clinical triage; high physical distress.
Caregiver Distress	3.1 / mo	Isolation, nocturnal fatigue, fear of catastrophic error	Leading driver of unscheduled home visits & attrition.

Table 1: Distribution Breakdown of Community Nursing Workload Volume (12-Month Audit **Data)**.

Caregiver Anxiety & Exhaustion: 38.1%
Technical Alarms: 29.4%
Vascular Access: 21.6%
Routine Audit: 10.9%

Strategic Alignment: Uk Government 10 Year Health Plan

The UK Government's 10 Year Health Plan ('Fit for the Future') [2] mandates three fundamental structural shifts in National Health Service delivery: moving care from acute hospitals into community settings, transitioning from analogue to digital infrastructure, and shifting from reactive treatment to proactive prevention. Integrating structured psychosocial digital tools into HHD programs directly aligns with these strategic priorities. Establishing Integrated Neighbourhood Teams (INTs) that combine community renal nurses, general practitioners, and voluntary sector resilience coaches enables HHD programs to decouple technical clinical troubleshooting from secondary emotional distress [3]. Capital investment in digital remote monitoring and intra-dialytic micro-interventions fosters proactive wellness management before acute caregiver breakdown necessitates emergency hospital admission or modality transition.

Policy Alignment Imperative: Enhancing out-of-hospital community renal infrastructure reduces acute hospital bed occupancy, safeguards unpaid family caregivers from physical exhaustion, and lowers long-term healthcare expenditure by supporting home dialysis retention.

Patient & Public Involvement (PPI)

Governance Framework

Patient and Public Involvement (PPI) is a core requirement under National Institute for Health and Care Research (NIHR) standards [4]. In the Positive PKD Feasibility Study (IRAS ID: 318294) [5], formal PPI mechanisms were established to guarantee that the intervention was co-designed alongside patients and unpaid caregivers, rather than engineered in isolation.

Through iterative co-design workshops, PPI contributors evaluated digital interface ergonomics, session timing, and mental workload constraints during active haemodialysis [6]. Key qualitative findings highlighted hope and perseverance as fundamental personal strengths drawn upon during treatment. Contributors also noted that nursing staff levels had decreased over the past 6 months. Furthermore, during

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a 40-minute online session with a participant recruited via a Kidney Research UK advertisement, the individual expressed a strong willingness to engage in research interventions and confirmed that utilizing a mobile device for 2–3 hours per week was manageable. Consequently, intervention delivery was strictly scheduled within Hours 1 and 2 of treatment, avoiding later hours when physical fatigue and cognitive fog predominate.

Methodological Baseline: Via Inventory & Case Application

To establish baseline character strength profiles, participants completed the validated Values in Action (VIA) Inventory of Strengths assessment during routine dialysis shifts. The VIA framework measures 24 universal character strengths categorized under six core virtue domains: Wisdom, Courage, Humanity, Justice, Temperance, and Transcendence.

Case Baseline Profile: Patient A	Assessment Battery & Metrics
• **Demographics:** Male, 54 yrs, 18 mos on HHD.	• **VIA Survey:** 120-item standardized strength inventory.
• **Primary Strengths Identified:** Hope (Optimism) & Perseverance (Industry).	• **Patient Activation (PAM-13):** Self-care efficacy.
• **Device Access:** Uses personal smartphone 2-3 times/week.	• **Zarit Burden Interview (ZBI-12):** Caregiver distress.
• **Clinical Application:** Deploys Hope during difficult cannulation; draws on Perseverance to manage post-treatment fatigue.	• **PHQ-9 / GAD-7:** Depression & anxiety screening.

Table 2: The VIA framework measures 24 universal character strengths categorized under six core virtues.

The Positive Pkd Digital Resilience Framework

The Positive PKD digital platform integrates established positive psychology constructs into micro-learning modules tailored for intra-dialytic administration:

- **Seligman's PERMA Model:** Systematically cultivates Positive Emotion (gratitude logs), Engagement (mindful absorption), Relationships (caregiver empathy prompts), Meaning (reframing therapy as life-enabling), and Accomplishment (tracking successful treatment milestones) [7].
- **Growth Mindset Dynamics (Dweck):** Reframes physical confinement and treatment fatigue from static limitations ("Dialysis controls my life") into active, adaptable challenges ("Dialysis cleans my blood so I can pursue my life goals") [8].
- **Intervention Architecture:** Micro-modules are delivered 2 to 3 times weekly, capped at <=20 minutes per session. Key digital features include interactive Character Strength Shields, guided cognitive reframing journals, and structured caregiver appreciation prompts.

Anticipated Outcomes & Strategic Recommendations

Embedding digital psychosocial resilience interventions within home dialysis programs offers dual benefits: reducing secondary panic-driven nursing contacts and stabilizing domestic care arrangements. Grounded in baseline audit metrics and feasibility design, we outline four strategic recommendations for clinical practice and health policy:

- **Proactive Post-Training Triage Pathways:** Establish dedicated nursing contact touchpoints during the vulnerable 2-8
- week post-transition window, focusing explicitly on caregiver distress and cannulation confidence.
- **Standardized Digital Psychosocial Prescription:** Embed tablet-based resilience platforms directly into standard HHD equipment bundles, elevating psychological support to equal status with physical dialysate supplies.
- **Integration with Neighborhood Health Teams:** Leverage NHS 10 Year Health Plan funding streams to integrate renal community nursing with local primary care, social care, and peer-support networks.
- **Structured Caregiver Respite & Activation:** Provide caregivers with tailored micro-interventions and formal peer-respite networks to mitigate chronic burnout and decouple clinical technical support from emotional exhaustion.

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