Feasibility of large-scale capillary blood collection for elderly persons

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Keywords: capillary blood collection; elderly persons; epidemiology; mailed sample; Million Women Study

Introduction

Collection of venous blood samples in elderly people can be challenging due to fragile veins, limited mobility and the need to travel to clinic appointments. These barriers might limit their participation in large-scale epidemiological studies.

Mailed capillary blood offers a cost-effective and minimally invasive approach for sample collection, and plasma biomarker measurements in capillary samples have been found to agree closely with venous samples[1,2]. If capillary blood collection were demonstrated to be feasible in an elderly population it could facilitate their participation in research studies.

The aim of this study was to assess the feasibility of collecting mailed EDTA capillary blood and documentation from elderly participants from the Million Women Study (MWS)[3], a UK population-based cohort study of women who were aged 50-64 years when recruited between 1996 and 2000.

Methods

A commercial At Home Capillary Blood Collection Kit (Alpha Laboratories Ltd), was carefully evaluated and customised so the components and Instructions for Use (IFU) were likely to be suitable for elderly users.

Invitations were sent to a subset of MWS participants (average age 81 years). Collection kits were dispatched to 950 of the willing responders across the UK. Kits and study documents were returned by 24 hour postal service to be processed in a central laboratory (Figure 1).

In-house software (Pandora) was developed to facilitate sample tracking and data linkage. Extensive detail of the sample collection procedure was documented, including information on:

- Packing integrity
- Inclusion of study documents
- Date and time of sample collection and receipt
- Sample volume and plasma haemolysis status

Laboratory staff specifically trained in handling small-volume blood samples centrifuged the Microtainer tubes and separated the plasma to store along with plasma-depleted blood in a -80°C freezer.

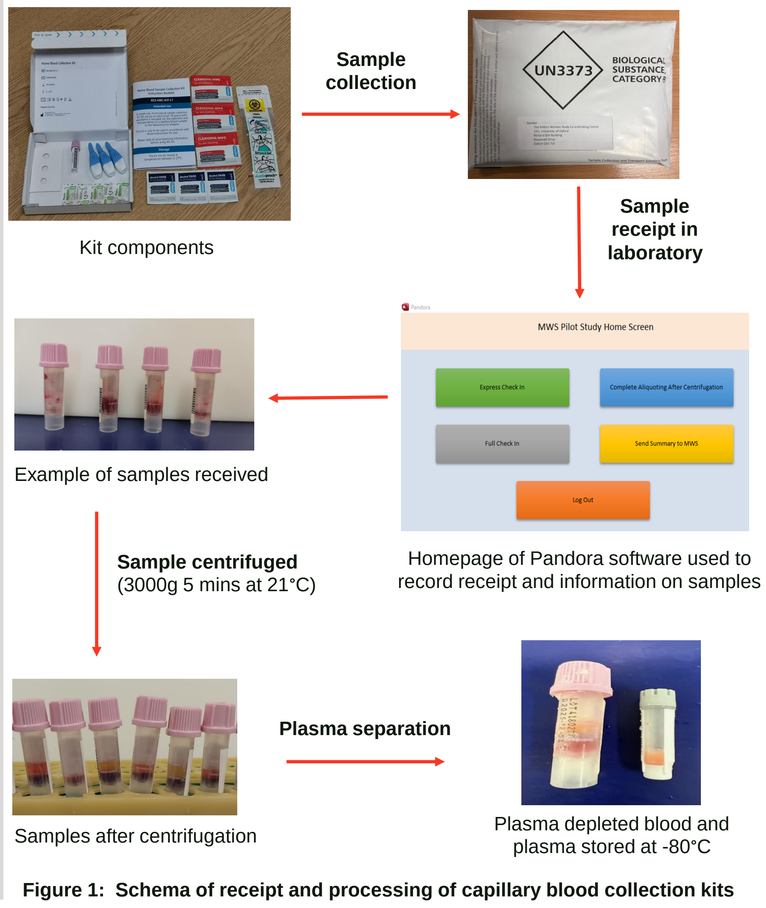

Figure 1: Schema of receipt and processing of capillary blood collection kits

Results

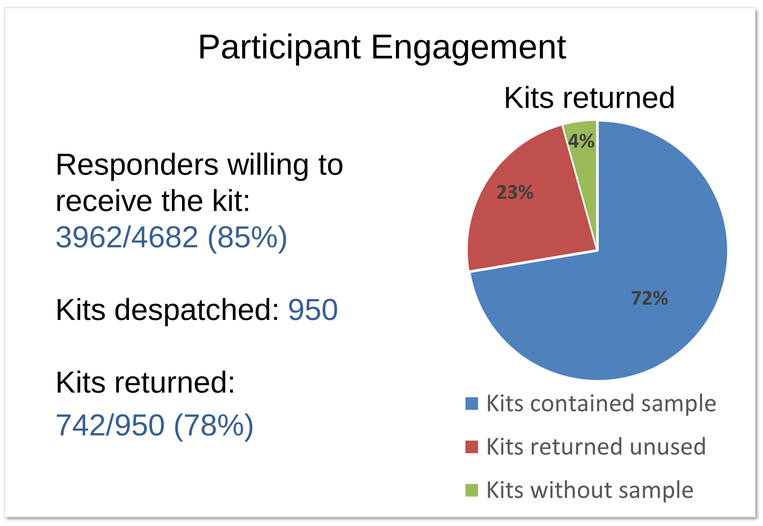

Figure 2. Participant interest was high (85%). Of the 950 kits despatched, 742 (78%) were returned and the majority contained a sample (n=536, 72%); remaining kits were returned unused (n=173, 23%) or empty (n=33, 4%).

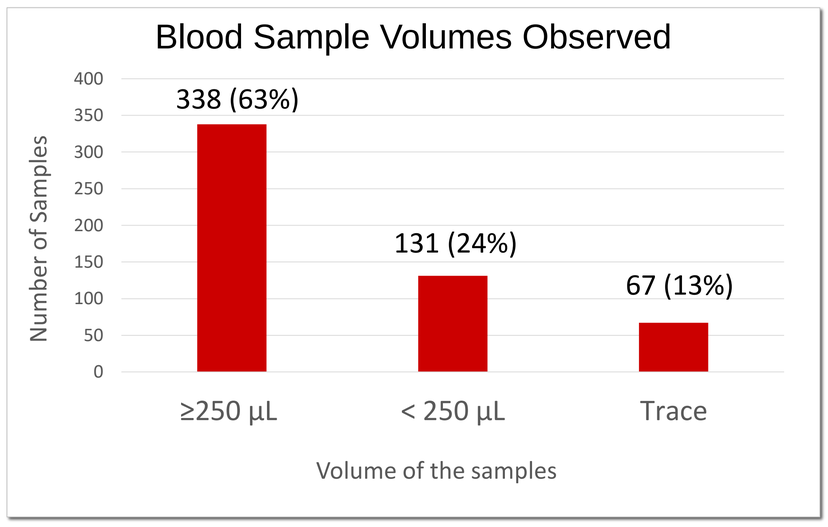

Figure 3. The majority of 536 samples received met or exceeded the desired volume of 250µL (n=338). A total of 131 samples contained less than 250µL and 67 contained a minimal "trace" volume.

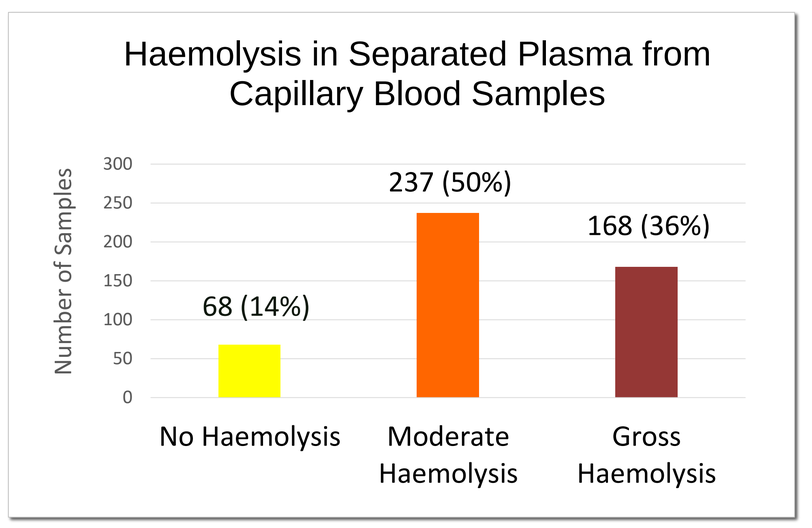

Figure 4. Separated plasma was obtained from 473 of the 536 blood samples received. The majority exhibited haemolysis, with 168 categorised as grossly haemolysed. A minority of 68 samples exhibited no haemolysis.

Discussion and Conclusions

The study demonstrated a high level of engagement, with 85% of responders to the initial invitation willing to receive a capillary blood sampling kit. Of 950 kits despatched, 742 (78%) were returned and the majority (n= 536, 72%) contained a sample (Figure 2). These findings demonstrate willingness amongst an elderly population to provide capillary blood samples.

Of the blood samples received, 473 (88%) were of sufficient volume to provide separated plasma and 338 (63%) met or exceeded the minimum desired volume of whole blood (Figure 3). These findings support the feasibility of self-administered capillary blood collection by elderly persons to provide adequate sample volume for analysis of biomarkers.

Haemolysis of plasma was found to be common with 405 (86%) of samples affected, of which 168 (36%) were categorised as grossly haemolysed (Figure 4). Plasma haemolysis can be influenced by collection methods, transport conditions and delayed processing and can limit the utility of the sample for biomarker testing. Refinement of the 'At Home' kit IFU may improve sample volume and plasma quality, alternatively other sample collection methods may prove more advantageous when good quality plasma is required. Of note, most samples in this study would be suitable for genetic analyses.

Conclusion: Our study supports self-collection of capillary blood samples as a cost-effective solution for epidemiological studies of elderly persons. Limitations include presence of haemolysis which may limit the utility of the sample for some biomarker testing.

References

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Acknowledgements

The authors would like to thank the MWS participants, and the Wolfson laboratory and MWS teams at Oxford Population Health.