Management of first trimester miscarriage after implementation of a standardized protocol in a tertiary hospital in Cape Town, South Africa – an observational study

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Declaration

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Date: December 2017

Abstract - English

Background

Spontaneous first trimester miscarriage is common problem in primary care and emergency settings. Management options have changed over time and now include surgical, medical and expectant management options.

Aim

To assess the effectiveness and complications of these various choices for women with first trimester miscarriages who present to an acute and outpatient early pregnancy service, Tygerberg hospital, a tertiary level public hospital in Cape Town, South Africa. Prior to this the standard practice was surgical management of first trimester miscarriages

Methods

A protocol introducing the various management options of first trimester miscarriages was created and implemented, and an audit was carried out over six months to assess outcomes between January 2015 and June 2015. Data was captured and analyzed with SPSS software using Kaplan-Meier analysis and Pearson Chi-square test.

Results

Of the 157 women whose management of their miscarriage was assessed, 32% had surgical, 40% had medical and 28% had expectant management. Median days until complete miscarriage was 1 [1 -66 days] for surgical, 10 [1 – 105 days] for medical and 18 [1 – 66 days] for expectant management. All patients who chose initial surgical management completed the miscarriage in that category. Seventy-five percent of women who intended medical management and 18.4% who chose expectant management successfully completed the miscarriage as initially planned. The remainder completed their miscarriages in the medically or surgically. Complication rates included: 10.2% blood transfusions, 5.1% sepsis, 1.3% misoprostol side-effects, and 0.6% re-evacuations.

Conclusion

Surgical management is the quickest and most effective option followed by medical and expectant management. Complication rates were high, reflecting the inclusion of unstable patients requiring urgent surgical management. Medical and expectant management should only be offered to stable low risk women. Counselling should include the time taken to completed miscarriage and the possible need to change the management method. This allows women to choose a management option best suited to them.

Abstrak - Afrikaans

Agtergrond

Spontane miskrame in die eerste trimester van swangerskap is ‘n algemene probleem in primêre sorg klinieke en noodeenhede. Die verskillende opsies vir hantering het verander oor die afgelope jare en daar is nou chirurgiese, mediese and afwagtende opsies beskikbaar.

Doel

Die doel van hierdie studie was om die effektiwiteit van hierdie verskillende behandelings opsies te ondersoek asook om die komplikasies te beskryf in vrouens wat met eerste trimester miskrame by ‘n noodeenheid sowel as buitepasiënt kliniek by Tygerberg Hospitaal hanteer word. Tygerberg Hospitaal is ‘n sekondêre en tersiêre verwysingshospitaal in Kaapstad, Suid Afrika. Die roetine hantering voor hierdie studie was chirurgie.

Metodes

Die studie volg na die skryf en implementering van ‘n nuwe protokol wat al die verskillende hanteringsopsies aanbied. ‘n Oudit vir die eerste ses maande na implementering is uitgevoer. Dataverwerking is uitgevoer met behulp van die SPSS sagtewarepakket en Kaplan-Meier oorlewings analises sowel as die Pearson Chi-kwadraat toets is gebruik waar nodig.

Resultate

Daar was 157 pasiënte in die studie en van hulle het 32% chirurgiese hantering gehad, 40% het mediese behandeling ontvang en 28% afwagtende of konserwatiewe hantering. Die mediaan vir die aantal dae tot die miskraam volledig was, was 1 dag (1-66 dae) vir chirurgie; 10 dae (1-105 dae) vir die mediese groep en 18 dae (1-66 dae) vir die groep met afwagtende hantering. Die vrouens wat die chirurgiese opsie gekies het, het slegs hierdie behandeling benodig. Van die mediese behandeling groep het 75% en van die konserwatiewe groep het 18.4% slegs die aanvanklike metode benodig en die res het addisionele chirurgiese of mediese behandeling benodig. Die komplikasies sluit bloedoortapping (10.2%), sepsis (5.1%), newe-effekte van misoprostol (1.3%) en herhaal ledigings van die uterus (0.6%) in.

Gevolgtrekking

Die mees effektiewe metode is chirurgie en daarna is dit mediese en dan afwagtende hantering. Daar was ‘n redelike hoë voorkoms van komplikasies, meesal as gevolg van onstabiele pasiënte wat chirurgie benodig het. Mediese sowel as konserwatiewe hantering moet net aan lae risiko vrouens wat heeltemal stabiel is aangebied word. Tydens raadgewing moet vrouens ingelig word oor die tydsduur van die verskillende metodes en die moontlikheid dat ‘n tweede opsie nodig kan raak. Dit sal vrouens toelaat om ‘n keuse te maak oor die metode wat die beste vir hulle sal werk.

Acknowledgements

Thank you to Dr JL VdMerwe and Prof L Geerts for helping develop the initial standard operating procedure, Prof S Gebhardt for reviewing statistics, and assistance with translation of abstract to Afrikaans, and thank you to Dr J Kluge for guiding the process from the start, and revising the thesis.

Lastly thank you to my family for continuing support.

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List of abbreviations

AP – anteroposterior

CRL – Crown Rump Length

ESHRE - European Society for Human reproduction and Embryology

GA – General anaesthetic

GS – Gestational sac

HB - haemoglobin

HCG – human chorionic gonadotrophin

IUCD – intrauterine contraceptive device

LA – Local anaesthetic

LMP – Last menstrual period

MVA – manual vacuum aspiration

NICE – National Institute of Clinical Excellence

RCOG – Royal College of Obstetrics and Gynaecology

RPR – rapid plasma regain

RVD – Retroviral disease

TVUS – transvaginal Ultrasound

WHO – World Health Organization

Introduction

Spontaneous miscarriage is one of the commonest reasons for acute presentation to gynaecologists, which occurs in 10.9–30% of all early pregnancies.[1,2] The 2014 Saving Mothers Report indicated that 4.3% of maternal deaths in South Africa happened due to miscarriages, a marginal increase from 3.5% in 2002-2004. The 185 women who died from miscarriages in the past triennium signify that their management is still an important priority as these deaths should be avoidable. [3]

According to Fawcus et al. sharp surgical curettage of the uterus was standard of care for managing miscarriages in South Africa in 1997, used 96.4% of the time, and manual vacuum aspiration (MVA) was used in 2.8%. Most cases were done under general anaesthetic (GA) in an operating theatre.[4] This was still the reality in 2002 when Jewkes et al. assessed management of incomplete miscarriages in all public hospitals in all nine provinces in South Africa where 82% received sharp curettage, 2.5% suction curettage and 14.8% MVA[5]. Moodliar et al. did a randomized trial in Durban in 2005 showing 91.5% effectiveness with medical management using 600 micrograms of misprostol, a prostaglandin E analogue with uterotonic properties, after 14 days follow-up. It was as safe, effective, and acceptable to women compared with sharp curettage under GA. In this setting where the comparison is medical versus surgical management under GA, medical management could be a cost saver in a resource constrained setting.[6]

Expectant, or conservative management involves allowing spontaneous passage of retained products of conception without intervention, but requires follow up of the patient. Medical management usually involves the use of Misoprostol to aid expulsion of retained products. Surgical management involves evacuation of the uterus with various MVA, suction aspiration or sharp curettage under local anaesthetic or GA in

an unstable patient.[7] MVA is related to fewer complications compared with sharp curettage of the uterus, and hence vacuum aspiration is World Health Organization surgical technique of choice.[8,9]

The UK MIST trial from 2006 is one of the landmark trials proving that giving a stable woman the choice between expectant, medical and surgical management is safe and satisfactory for women.[10] Expectant management involves no treatment to the patient, but continued follow-up to assess whether the miscarriage has resolved spontaneously. The National Institute of Clinical Excellence and Royal College of Obstetrics and Gynaecology (NICE/RCOG) guidelines from 2012 advise that expectant management should be first line for the first 7 to 14 days in stable cases, with appropriate counseling and follow-up. After the initial wait, one can still offer medical management or surgical management as clinically indicated.[7] Table 1 provides a summary of the advantages and disadvantages of the three methods of management of a first trimester miscarriage in a stable patient.

Table 1: Summary of advantages and disadvantages of the various methods of miscarriage management

Summary of methods			
	Expectant	*Medical*	*Surgical*
Advantages	• Avoids surgical and anaesthetic risk • Allows women to continue daily routine • More acceptable to some women	• Avoids surgical and anaesthetic risk • Faster resolution compared with expectant management	• Planned and predictable treatment • High success rate • Essential in unstable patient
Dis-advantages	• May have more prolonged bleeding • Timescale and outcome not predictable • 23-50% may need	• Greater analgesic need • More vaginal bleeding • 29-38% of cases may need surgical evacuation[10] • Risk of unscheduled	• Risk of anaesthetic (less if local) • Risk of uterine perforation and cervical trauma, and intrauterine adhesions

	surgical evacuation[10] • Risk of unscheduled evacuation if heavy bleeding occurs	evacuation if heavy bleeding occurs • Side effects of misoprostol: diarrhoea, vomiting, pyrexia.

Despite the evidence available, surgical evacuation of the uterus was mainstay of treatment of miscarriages at Tygerberg hospital. Alternative methods were not routinely used.

The aim of this study was to assess the **effectiveness** and **adverse events** of the surgical, medical and expectant management options in women with first trimester miscarriage presenting to a public gynaecology service after implementing a new protocol. This was done by creating a protocol, implementing the protocol and auditing the outcomes.

Literature review

Definitions

When reviewing the literature on miscarriages there are different definitions and terminology used depending on continent and context. In the UK, the combined RCOG and NICE guideline say a miscarriage is the loss of an intrauterine pregnancy before 24 completed weeks of gestation [7]. The World Health Organization (WHO) define a miscarriage as *"the expulsion from its mother of an embryo or foetus weighing 500 g or less with no signs of life"*, corresponding to a gestational age of 20 - 22 completed weeks of gestation. Miscarriages are classified as early, or first trimester if they occur before 12 full weeks (12^{+6}), and second trimester if they occur between 13^{+0} and 24^{+0} weeks of gestation. [11]

European Society for Human reproduction and Embryology (ESHRE) define first trimester up to week 12, and second trimester from 12 – 24 weeks[12]. This protocol used the RCOG and WHO definition.

Diagnosis

History and examination is imperative in diagnosing miscarriages, the most common presenting complaint being vaginal bleeding. Last menstrual period (LMP), bleeding pattern and pain, must be elicited to help distinguish it from other causes of bleeding. Transvaginal ultrasound (TVUS) is routinely used to confirm intrauterine position of pregnancy, and there are various criteria used to diagnose the different types of miscarriages.[13]

Crown rump length (CRL) should be measured with the fetus in a neutral position, from crown to rump, excluding the yolk sac. The inter-observer variation of CRL has been reported as 15%, so the cut-off of seeing a fetal heart at 5mm previously used has increased to 7mm, as some of the pregnancies with CRL of 5-7mm subsequently developed into viable pregnancies.

Gestational sac (GS) size should be measured as the mean sac diameter (average of the sagittal, transverse, and antero-posterior (AP) diameters of the sac). The inter-observer variation of GS has been reported to be 19%, so the GS size of 25mm is felt to give the best specificity and positive predictive value of 100%.[14]

Missed miscarriage is a term that is used in the NICE/RCOG guideline, but is not widely used in the literature. It is an umbrella term and incorporates "missed abortion", "anembryonic pregnancy", "blighted ovum", "early fetal demise", "non-viable pregnancy" and " early embryonic death".[7] WHO used the term "missed

abortion" when doing the review of misoprostol for treating first trimester miscarriage in 2007, but the term miscarriage is now preferred over abortion.[2,15]

Incomplete miscarriage, with retained products of conception can be clinically suspected if there is persistent or increased bleeding, abdominal pain, fever and endometritis, or if the bleeding does not start for a missed miscarriage. Ultrasound will show irregular heterogeneous echoes within the endometrial cavity, and the AP endometrial lining is more than 15mm. However, studies of ultrasound appearances after uterine evacuation for first trimester terminations have shown that in an asymptomatic patient active intervention is not necessary.[16] Management of retained products of conception can be expectant[7,10], medical or surgical with MVA or hysteroscopy[17].

A diagnosis of a *complete miscarriage* can only be made when a prior intrauterine pregnancy was seen on ultrasound, and if this is not the case it has to be called 'pregnancy of unknown location' and followed up with serum human chorionic gonadotrophin (hCG). In a study by Condous they found that 5.9% of 152 women with apparent complete miscarriage on TVUS had ectopic pregnancy when followed up with serial hCG.[18]

Pregnancy of uncertain viability is a term that has been used increasingly after some cases had been reported where women were told they had a miscarriage but ended up with a viable pregnancy. This is not only potential cases for litigation but can also be very distressing for women. NEJM published guidelines for diagnosing definite pregnancy failure, and features suspicious of failure, from an expert consensus group. These features are similar to the criteria to diagnose miscarriages, but also add timelines for repeating scans to ensure the accuracy of diagnosis. [14]

History, examination and investigation of miscarriages

Any patient with a suspected miscarriage, who presents with vaginal bleeding and has a positive pregnancy test, should always be assessed according to the ABC principle (Airway-Breathing-Circulation) to ensure the mother is stable, then a good history and examination should be conducted.[7]

As a minimum the following should be elicited from the history:

- Age, Gravity, Parity
- LMP, pregnancy test done in this pregnancy
- Pain: Site, onset, character, radiation, alleviating/associated symptoms, timing, exacerbating factors, severity
- Vaginal bleeding: duration and severity
- Passage of products of conception
- Medical history
- Surgical history
- Gynaecological history: menstrual cycle, last Pap Smear, contraception use, risk factors for ectopic pregnancy

The following risk factors are present up to 23% of patients with an ectopic pregnancy according to the NICE/RCOG guidelines. On average 37% of women have no risk factors recorded.

- Previous pelvic inflammatory disease
- Previous tubal/abdominal surgery
- Previous ectopic pregnancy
- Assisted reproduction
- Infertility
- Conceiving with IUCD or on the progesterone only pill
- Conceiving after sterilization failure
- Multiple sexual partners
- Endometriosis

The examination should be thorough and focus on looking for signs and symptoms of shock and any organ dysfunction due to inadequate perfusion, which would require urgent action.

- Observations: blood pressure, pulse, respiratory rate, temperature,
- Sideroom investigations: haemoglobin (Hb), urine pregnancy test,
- General cardiovascular and respiratory examination
- Abdominal examination: masses, guarding, rebound, location of pain
- Gynaecological exam:
    - *Speculum*: Cervical os: open or closed, Offensive discharge, Presence of necrotic cervical tissue/ cervical trauma
    - *Bimanual examination*: Cervical excitation tenderness, size of uterus, Adnexal masses or tenderness

TVUS can then be done with consent if indicated by history and examination, using the diagnostic criteria mentioned above.

Treatment options

Modern management of miscarriages has been described in guidelines for more than 10 years. The well-recognized WHO/FIGO, American and European professional colleges have produced guidelines on management of early miscarriages, as per summaries found below.

Table 2: Overview of management options

Incomplete and Missed miscarriage			
	NICE/RCOG[7]	**ACOG**[19]	**WHO and FIGO**[20]
Expectant	Reassurance, emergency contact, analgesia. Follow-up 14 days	Education, reassurance, emergency contact, analgesia. Follow-up 14 days but allow up to 8 weeks	n/a
Medical **(dose of misoprostol**	Incomplete: 600 mcg po or sl Missed:	800 mcg pv, can repeat dose after 3h up to 7 days. Follow up 7 – 14	Incomplete: 600 mcg po or 400 mcg sl

in mcg)	800 mcg po/sl can repeat dose after 24h. Follow up 14 days.	days	Missed: 800 mcg pv or 600 mcg sl, can repeat dose after 3hours. Follow-up 7 -14 days.
Surgical	MVA, setting not specified	MVA in office setting under local anaesthetic	n/a

Evidence for current management

The MIST trial from 2006 is one of the most robust sources of evidence available for management of miscarriages. It was a randomized controlled trial that compared expectant vs. medical vs. surgical management in 1200 women with miscarriage [10].

They included women at less than 13 weeks' gestation who had been diagnosed as having either an incomplete miscarriage or missed miscarriage (early fetal/embryonic demise). Women with severe haemorrhage or pain, pyrexia above 37.5°C, severe asthma, haemolytic disease or blood dyscrasias, current anticoagulation or systemic corticosteroid treatment, twin or higher order pregnancy, who were smokers aged over 35, and unable to understand written English were excluded. Their definition of incomplete miscarriage was "areas of mixed echogenicity within the uterine cavity with or without a disordered gestation sac". Early embryonic demise defined as "intact gestation sac of greater than 20 mm mean diameter with no other internal structures", and early fetal demise as "a fetus of over 6 mm crown- rump length with no heart activity on TVUS".

Their protocol for expectant management was giving the women a specific information sheet on miscarriage, 30 tables with a paracetamol-dihydrocodeine combination, and an emergency telephone number.

The medical management arm differed between the incomplete miscarriage and missed miscarriage groups; incomplete miscarriages were admitted to hospital and given a single vaginal dose of 800 mcg misoprostol. Women with missed miscarriage were pre-treated with a single oral dose of 200 mg mifepristone, and then admitted to hospital 24-48 hours later for a single vaginal dose of 800 mcg misoprostol. A surgical procedure was offered if expulsion of retained products had not started within eight hours of insertion of misoprostol.

Women in the surgical management arm were admitted for suction curettage under GA. No prophylactic antibiotics were used at the time of curettage.

The group managed medically, had 29% unplanned surgical curettages of incomplete miscarriages, and 38% unplanned procedures for early pregnancy failures. The expectantly management group had 23% unplanned surgical curettages in the incomplete miscarriage group, and 50% unplanned procedures in the early pregnancy failure group.

Materials and Methods

Setting

Tygerberg hospital serves a catchment area of 1 874 586 people in the Metro East part of Cape Town in South Africa, a upper middle income country.[21] The gynaecology emergency admissions area services 362 patients per month according to the 2015 Tygerberg hospital annual report. It is manned 24 hours a day by a professional nurse with every patient being assessed by an onsite registrar (specialist in training) and intern with the availability of an offsite consultant if needed. During the week, a day-theatre is available between 07.30 – 15.00, for performing MVAs under local anaesthetic. When emergencies occur after-hours, or if the patient is too unstable for

the procedure under local anaesthetic, a main theatre, and a labour ward theatre within the hospital with emergency staffing on site can be used for emergency cases.

Methods

In 2014 an evidence-based protocol was written at Tygerberg, which was primarily based on the NICE/RCOG guideline, and tailored it to the local context.[7] It was the first structured protocol in this hospital on alternative methods of managing first trimester miscarriages (see Appendix 1). Staff were educated on the protocol at academic meetings, informal teaching of registrars (specialists in training), and physical copies of protocols were distributed in key clinical areas.

Patients with first trimester miscarriage up to 12^{+6} weeks of pregnancy were assessed and classified as stable or unstable using the following hemodynamic parameters (pulse >90 bpm, blood pressure >90/50 mmHg, respiratory rate > 20/min, and temperature > 37.5 ^{0}C), clinical signs (foul smelling products, uterus >12 weeks size, organ dysfunction, clinical signs of infection) or side room investigations (Hb < 10.0 g/dL), as per Appendix 1. Stable patients with miscarriages were counselled and given the choice of their management, as per protocol. Unstable patients were offered surgical method only. Ectopic pregnancies, pregnancy of unknown location and molar pregnancies were not addressed in the protocol.

Miscarriages were defined as first trimester if they were less than 13 weeks by LMP, clinically, or by scan. Registrars in the gynaecology admission area did the scans using the following definitions as defined in the protocol, and if there were any uncertainty, a formal scan by the ultrasound department would be done.

- *Incomplete miscarriage* was diagnosed if the anterior posterior (AP) diameter of the irregular heterogeneous echoes was ≥15 mm on TVUS).

- *Missed miscarriage* was defined as:
    - a) Empty GS: ≥25 mm mean GS diameter with no visible embryo or yolk sac
    - b) Presence of an intrauterine GS of <25 mm in which an embryo did not become visible on repeat scan after at least 7 days
    - c) Embryo with CRL ≥ 7mm with no visible heart activity
    - d) Initial visualization of an embryo or fetus with visible heart activity <7 mm followed by a repeat scan showing an absence of heart activity.[7,22]
- *Complete miscarriage* was diagnosed if AP diameter of uterus was <15 mm, and if prior intrauterine pregnancy had been seen on USS or products of conception visualised by attending doctor. If this were not the case the patient would be followed up in early pregnancy clinic to rule out ectopic pregnancy.

All patients had booking bloods (Rhesus, RPR, RVD) drawn if the referring clinician had not done this, and acted on as needed. Rhesus negative women were offered Anti-D immunoglobulin (Rhogam ®) 250 IU (50 micrograms) as per NICE guidelines.[7] Future family planning choices were discussed with all patients, and was provided by family planning unit as per patient choice, or advised to attend local clinic if the service was declined.

- *Expectant management* involved counselling patients on what to expect in terms of bleeding and pain, providing them with non steroidal anti-inflammatory (NSAID) (Ibuprofen 400mg 8hrly), explaining warning signs (temperature, heavy PV bleeding ie soaking >2 pads per hour for >2hours, foul smelling discharge, severe pain not responding to NSAID), and providing them with an appointment in the early pregnancy clinic 10 to 14 days later.

- *Medical management* involved counselling as above, and providing 600 micrograms Misoprostol sublingually for incomplete miscarriages, and 800 micrograms Misoprostol sublingually for missed miscarriages. The patients were advised that if no bleeding occurred within 24 hours, they should return for a repeat dose. They were offered follow-up 10 - 14 days later in the early pregnancy clinic.
- *Surgical management* involved arranging for MVA in the day theatre under local anaesthetic, either on the same day if in office hours, or to return at the next available opportunity to have it done. Patients too unstable to wait were booked in main theatres or labour ward theatres for evacuation of the uterus.

Data collection

Data was collected for patients presenting between 1 January 2015 and 30 June 2015, and patients were followed up until discharge, or lost to follow-up. Patients were identified from the gynaecology emergency admission register, crosschecked with early pregnancy clinic registers and theatre registers, and notes were reviewed retrospectively. A data collection sheet was implemented, see Appendix 2.

336 records were reviewed for eligibility; 157 had complete information enabling them to be included, 86 had other diagnoses like ectopic pregnancies and pregnancy of unknown location and 93 women were assessed but excluded. Of these 93, 18 of them had incomplete crucial information such as missing gestational age making it unclear whether it was first or second trimester, and 75 had missing notes. Attempts were made to retrieve missing notes from medical record department but were not successful.

Aims and objectives

The aim of this study was to assess the effectiveness and adverse events of the

surgical, medical and expectant management options in women with first trimester miscarriage presenting to a public gynaecology service after implementing a new protocol. This was done by creating a protocol, implementing the protocol and auditing the primary and secondary outcomes.

Primary outcomes

- Days until completed miscarriage
- Percentage of women who completed their miscarriage with the original method chosen: those who started with a specific method, and had confirmed complete miscarriage with the same method were counted. The denominator was all of the women starting off in that category minus the loss to follow-up.

Secondary outcomes

- Complication rate (including need for blood transfusion, infection needing IV treatment, misoprostol side-effect requiring hospital admission, need for re-evacuation of uterus).

Statistics

Data was analysed using Kaplan-Meier analysis for the survival analysis, and women were included in the survival analysis until they completed their miscarriage, or lost-to-follow-up. The Pearson Chi-square test was used to assess categorical baseline data, and one-way ANOVA used for baseline continuous variables.

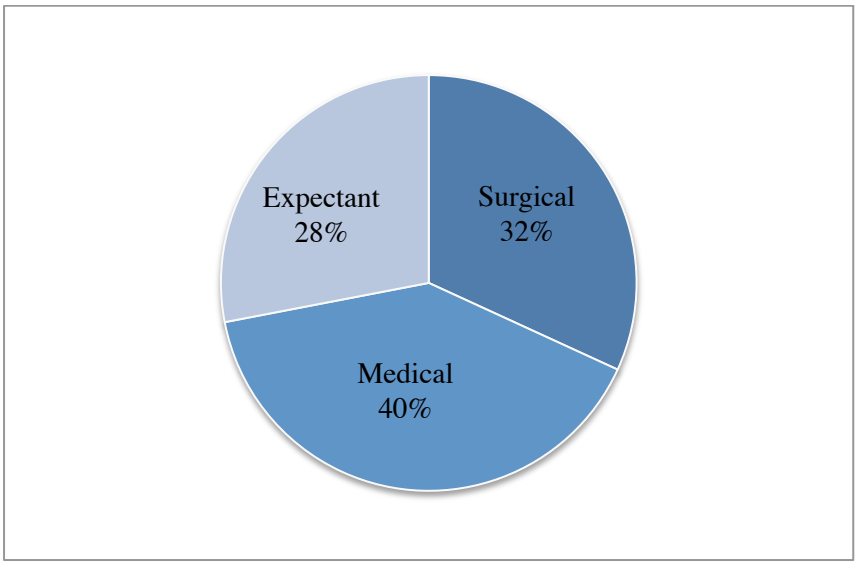
Ethics

Ethics-Committee (HREC) approval was obtained (S/14/10/246) from Stellenbosch University.

Results

157 women were assessed for first trimester miscarriage over the six months. 50 had surgical management (MVA in day theatre if stable and evacuation of uterus in main theatre if unstable), 63 had medical management, and 44 had expectant management to start with.

Figure 1: Method used to start, by initial method chosen



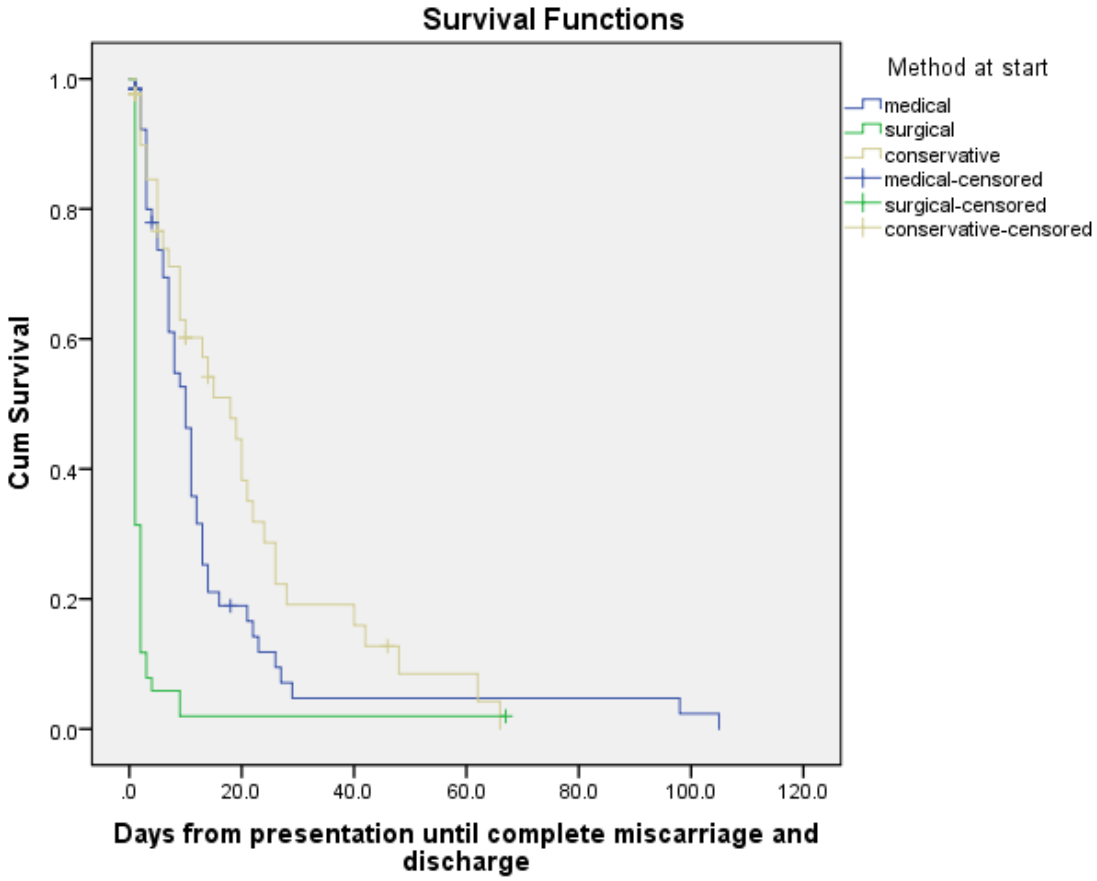
The mean age of patients was comparable, as was the gestational age at which they presented as per Table 3. There was a significant difference with lower gestational age in the expectant group ($p < 0.001$). There were more nulliparous patients in the expectant group (34.1%) as opposed to the surgical (24.0%) and medical (15.9%) groups respectively. The proportion of stable miscarriages as determined by the protocol were 44.0% in the surgical group, 85.7% in the medical group and 84.1% in the expectant group, indicating protocol violations.

Table 3: Patient characteristics, Classified by initial method

Characteristic	Surgical (n = 50)	Medical (n = 63)	Expectant (n = 44)	P values
Mean (SD) age (years)	30.0 (7.1)	31.3 (7.3)	29.8 (7.0)	0.515
Nulliparous % (n)	24.0 (12)	15.9 (10)	34.1 (15)	0.100
Mean gestational (SD) age (weeks)	9.7 (2.1)	9.9 (2.2)	8.1 (2.6)	<0.001
≥1 Previous miscarriage % (n)	20.0 (10)	22.2 (14)	31.8 (14)	0.356
Stable (Safe miscarriage) % (n)	44.0 (22)	85.7 (54)	84.1 (37)	<0.001
Mean haemoglobin (SD) (mg/mmol)	10.6 (2.3)	12.1 (1.5)	11.7 (1.5)	<0.001
HIV pos % (n)	8.0 (4)	12.7 (8)	11.4 (5)	0.099
HIV unknown % (n)	32.0 (16)	25.4 (16)	9.1 (4)	
HIV negative % (n)	60.0 (30)	61.9 (39)	79.5 (35)	
Type of miscarriage				<0.001
Incomplete	68.6 (35)	53.2 (33)	15.9 (7)	
Missed	29.4 (15)	46.8 (29)	34.1 (15)	
Uncertain viability	0 (0)	2 .0 (1)	50.0 (22)	

The time to event analysis looked at time from presentation until complete miscarriage, see Figure 2. Patients follow the survival curve of their original category (intention to treat analysis), and they were censored when they were lost to follow-up. Chi-square test was done with p = 0.001, indicating a significant difference in days until complete miscarriage between the groups.

Figure 2: Kaplan-Meier survival on days from presentation until complete miscarriage and discharge based on initial method



All patients following up achieved the main end point of a complete miscarriage, however, not all completed it in their original category, as seen in Table 4.

Table 4: Primary outcomes

	Surgical (n = 50)	**Medical (n = 63)**	**Expectant (n = 44)**	**P values**
Days until complete miscarriage Median [range]	1 [1,67]	10 [1,105]	18 [1,66]	<0.001
Completed miscarriage in	100 (50/50)*	75 (36/48)**	18.4 (7/38)**	<0.001

original category % (n)				
Loss to follow-up	0 (0)	31.7 (20)	13.6 (6)	0.001

* 1 patient needed re-evacuation, ** Loss to follow up (LTFU) excluded, but crossovers included

Complications were commonest in the surgical group. The details of which are indicated in Table 5. Two experienced misoprostol side-effects severe enough to require hospital admission.

Table 5: Secondary outcomes recorded as per original category

Secondary outcome	**Surgical (n = 50)**	**Medical (n = 63)**	**Expectant (n = 44)**	**Total (n = 157)**	**P values**
Complications % (n)	32.0 (16) *	9.5 (6)	2.3 (1)	14.7 (23)	<0.001
Blood transfusion	26.0 (13)	3.2 (2)	2.3 (1)	10.2 (16)	<0.001
Infection	12.0 (6)	3.2 (2)	-	5.1 (8)	0.026
Side effect (Misoprostol)	-	3.2 (2)	-	1.3 (2)	0.212
Re-evacuation	2.0 (1)	-	-	0.6 (1)	
Repeat miso dose (2 or more) % (n)	-	19.0 (12)	9.0 (4)	10.1 (16)	

* 4 Patients had both blood transfusion and sepsis

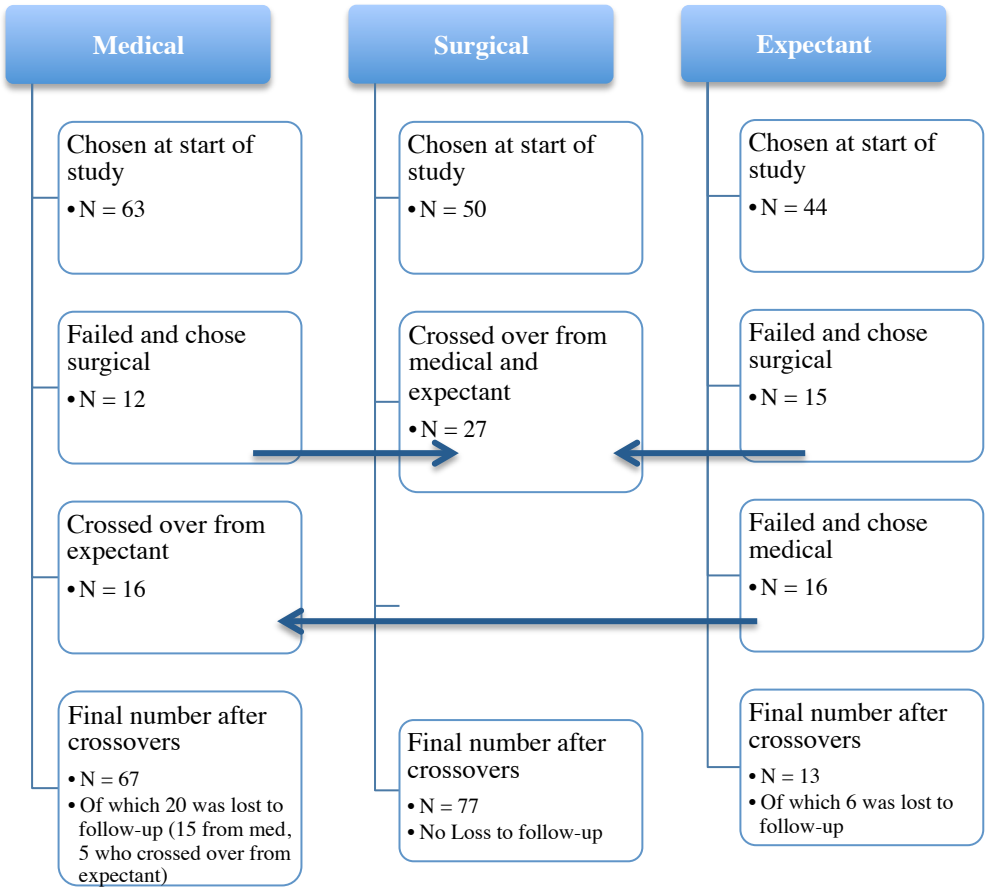
Sixty-three patients started with medical management of their miscarriage. Of those, 12 (19%) failed to achieve complete miscarriage and had surgical management, as per Figure 3. Of these 12 patients, 8 had one dose of misoprostol, 2 had two doses and 2 had three doses of either 600 or 800 micrograms as per protocol for incomplete and

missed miscarriage respectively. On average, 1.19 doses of misoprostol were needed, the median being 1.

Forty-four patients started with expectant management. Fifteen (34%) of these did not achieve complete miscarriage, and chose surgical management. Another 16 (36%) changed to medical management. Thirteen (30%) completed their management expectantly, but 6 of these patients were lost to follow-up.

50 patients had surgical management from the start, but had 12 patients added from medical group, and 15 from the expectant group. One of the patients in the surgical group needed re-evacuation of the uterus.

Figure 3: Flow of patients through the clinical system



Discussion

Principal findings

The patient population was similar with regards to age and parity, but there was a statistically significant lower gestational age in the expectant group, probably as the pregnancies initially were of uncertain viability and the diagnosis of miscarriage was only confirmed at re-evaluation 10 – 14 days later as per protocol.

All unstable patients, which included patients with Hb <10.0g/dl, should have been managed surgically as this is the quickest way to diminish vaginal bleeding caused by a miscarriage and as a result there were more unstable patients in the surgical group. There were 14.3% of women in the medical group and 15.9% in the expectant group that were unstable as defined in the protocol, and should have been managed as such.

This might have been an intentional protocol violation as the service at times has limited bed availability, limited theatre access after-hours, and some patients, despite the haemoglobin being below the threshold, were deemed to be stable. Of the protocol violations, none suffered complications of bleeding or infection, but two needed an evacuation on return. Clinicians included patient's ability to return to the facility in the decision-making when considering options.

For the primary outcome of time to complete miscarriage, surgical management is understandably the most effective with median days till completion of 1 day, for medical it is 10 days and for expectant it is 18 days. There are outliers that complicate the survival graph as per Figure 2. Some experienced retained products needing several courses of misoprostol, clinic follow-up, and one patient eventually had a hysteroscopy with surgical evacuation under USS guidance to evacuate the uterus with histology showing fibrosed retained products of pregnancy. There might have

been an over-diagnosis of retained products of conception as our definition of complete miscarriage was ultrasound finding of less than 15mm AP diameter. Anecdotally, in the early pregnancy clinic, there has been a tendency to rely more on ultrasound findings rather than clinical findings, and a blood clot can sometimes appear like products for an inexperienced provider.

The patient flow diagram, Figure 3, shows that of the patients who chose medical management, 75% will complete the miscarriage in that category. The completion rate of women who initially chose expectant management is low (18.4%). This may be explained by some of them having pregnancies of undetermined viability initially where women chose to wait in the hope that the pregnancy might still continue, or these women needed time to process the information and consider their options.

The complication rate was the highest in the surgical group, with 32% having at least one complication which included 26% who received blood transfusions, 12% had sepsis, and 2% required re-evacuation. This high complication rate is a reflection of the 66% of women within the surgical group being unstable at initial presentation whose appropriate management was surgical evacuation rather than complication of the surgical evacuation procedure itself. No patient within this group had a procedure related complication namely uterine perforation or cervical trauma[23]. The medical group had an overall complication rate of 9.5%, spread equally between blood transfusion, sepsis and drug side effects. Expectant management was safest with only 2.3% complication rate which is a reflection of the nature of the miscarriage in women with prolonged heavy bleeding electing to complete their miscarriage either medically of surgically with only 30% of women who initially chose expectant management completing their miscarriage in this group.

Strengths and limitations

Strengths of the study involved the inclusion of both stable and unstable patients, which is important in the South African context where miscarriages still carry significant morbidity and mortality. Another strength was that patients who were eventually lost to follow-up were kept in the analysis as long as possible, even if the last visit did not occur.

Methodological limitations were information bias with several missing files. Measurement bias could have been an issue as different clinicians conducted scans on follow-up, causing potential inter-rater variability. Other limitations included loss to follow-up, which is difficult to overcome. Specifically sampling a small number of the group of lost patients to see what happened would have been one way to overcome this.

Study in perspective

The complication rate is higher in comparison with studies done in Africa. Bique et al. from Mozambique who compared 600mcg misoprostol (medical evacuation) vs surgical evacuation of miscarriages, observed only one case each of sepsis and haemorrhage out of 270 women.[24] Dao et al. in Burkhina Faso compared the same methods and reported one blood transfusion and one case of sepsis out of 447 women in 2007.[25] Weeks et al. compared medical vs surgical methods in Kampala Uganda in 317 women, of which one required laparotomy for acute abdomen with a pelvic abscess, four had sepsis, five had cervical trauma, and no blood transfusions were reported.[26] It is important to note that these studies were done under strict trial conditions and excluded unstable patients, where as the index study includes a high rate of unstable patients, which reflects a real-life situation and current practice at our institution. Many studies did not objectively report on complication rates, but rather

on women's perceptions of bleeding, pain and side effects. This is difficult to interpret as it is unknown whether the bleeding was significant enough to require admission or transfusion, the infection severe enough to require admission and antibiotics and the side effects severe enough to necessitate admission.[6,27] The surgical evacuation rate for medically managed patients was 19% and for expectantly treated patients it was 34%.

Patients lost-to-follow-up is not an unknown problem, with Weeks et al. in Uganda reporting a 40% loss-to-follow-up.[26] Loss to follow up may indicate that these women experienced barriers to returning and thus might have experienced an unrecognized complication, or returned to a different facility with their problem, or their miscarriage resolved spontaneously without complications and they chose not to return due to this. These patients should be the focus of future research to find out why they do not return and look for ways to improve this.

Returning for follow-up visits can be both costly and logistically challenging for a socioeconomically deprived population. Rather than seeing the noted protocol violations as solely failure of protocol compliance, they highlight areas of challenges in service delivery and access to healthcare, particularly clinicians' need to be able to do safe surgical evacuations under local anesthetic in a timely manner ideally in a convenient setting. At this institution, a procedure room open for use 24 hours with adequate staffing and equipment would aid service delivery. Also, de-centralising this basic service to district hospital setting for stable patients, would both make the waiting time to be evaluated and managed shorter. It would also ease the workload at the referral-hospitals as the delay in management often leaves the patient in need of more resuscitation and at risk of suffering from complications. This has been

addressed in the ESMOE guidelines used to train health care professionals working at all levels from primary care settings up to tertiary hospitals.

Surgical management is the most effective management in our context, but in the appropriately selected patient who is able to follow up, medical and expectant management are good alternatives.

Future focus areas

Patient satisfaction was not assessed in this study, and would be a valuable next step to consider in a resource-constrained context, to allow further improvement of services. The protocol made a difference in terms of the management options becoming clearer for clinicians and patients alike, and giving staff the confidence to manage these patients, and for patients knowing there was a safety net and a follow-up plan available. Auditing the outcomes gave a unique picture of how the service runs, and how it might be improved upon. Continuous training of health care professionals in management of first trimester miscarriages should remain a focus, and regular auditing should be carried out to ensure a safe service. Enabling effective service provision at the appropriate level of care can also help improve the service by having the patient managed timeously, and locally when possible.

Conclusion

Modern management of first trimester miscarriages was implemented for the first time according to a specific protocol within Tygerberg Hospital, a secondary and tertiary level hospital within the Cape Town Metropole, and has given the department a safe framework to treat patients. In addition, it offers patients the choice of treatment.

Author contributions

AB did the literature review for the protocol, developed the research protocol, collected data, entered data, and wrote up manuscript.

JK helped developing the protocol, reviewed methods, and reviewed the manuscript.

Ethical considerations

Ethical approval was obtained from the University of Stellenbosch Health Researcher Ethics Committee with reference number S14/10/246.

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Appendices

Appendix 1

TYGERBERG HOSPITAL
Department of Obstetrics and Gynaecology: General Specialist Services

Protocol for the Management of a First Trimester Miscarriage (<13 weeks)

Aim: to manage early pregnancy loss in an outpatient setting, thereby providing women with alternatives other than routine surgical uterine evacuation and performed in a setting chosen by the woman.

Contents

In all cases:

- Ensure that the correct diagnosis has been made
- Decide if the patient has a safe or unsafe miscarriage
- All women should be adequately counselled on their options for miscarriage management, family planning and future fertility
- A safety net should be provided in terms of scheduled or unscheduled follow-up appointments

Terminology and transvaginal ultrasound criteria for diagnosing miscarriage; with clinical correlation findings		
Diagnostic term	*Ultrasound criteria*	*Clinical findings*
Pregnancy of uncertain viability	Presence of an intrauterine gestation sac (GS) of less than 25mm in which an embryo or yolk sac is not seen OR Embryo with CRL ≤ 7mm with no heart activity	Minimal vaginal Bleeding or pain, closed cervix
Early pregnancy loss/ Delayed/Missed miscarriage	Embryo with CRL ≥ 7mm with no visible heart activity (may be referred as an embryonic loss if <9wk6/7/ CRL <10mm or a fetal loss if ≥10wk0/7/ CRL >30mm) OR The presence of an embryo of less than 7mm in which fetal heart is not visible when repeat scan is performed after at	Minimal vaginal Bleeding or pain, closed cervix

	least 7 days (may also be referred to as an embryonic loss) OR Gestational sac with a mean sac diameter greater than or equal to 25mm with no visible embryo or yolk sac (also termed empty sac)	
Incomplete miscarriage	Irregular heterogeneous echoes within the endometrial cavity, anterior-posterior (AP) endometrial lining > 15mm	Passage of some pregnancy–related tissue and/or bleeding and/or abdominal pain, open cervix
Complete miscarriage	The ultrasound finding of an empty uterus after initial visualization of an intrauterine GS (with or without embryo) with AP endometrial lining of < 15mm Or The ultrasound finding of an empty uterus in association with a positive pregnancy test, followed by rapid decrease in serum βHCG levels (also known as failed pregnancy of unknown location; as failed ectopic pregnancy cannot be ruled out)	Cessation of vaginal bleeding & abdominal pain, closed cervix

MANAGEMENT

Initial assessment and workup of miscarriage:

- The Early Pregnancy Assessment Checklist should be used for note keeping in all patients presenting C2A gynaecological emergency centre and with a pregnancy test positive
- Obtain a good history of any vaginal bleeding or pain; including risk factors for ectopic pregnancy.
- Check booking bloods if patient is booked (Rh, syphilis, HIV
  - Offer rapid HIV for all pregnant patients if status unknown.
  - Perform rapid Rhesus and syphilis test in all women presenting with problems in early pregnancy if not known
- General examination:
  - Vital signs (Temperature, Blood pressure, Heart rate, Respiratory rate) urine diagnostic strips, urine pregnancy test.
  - Cardiovascular, respiratory and abdominal examination.
- Specific examination:
  - Assess vaginal bleeding by speculum and bimanual examination.
  - Speculum examination:
    - Examine cervical os: open or closed? Macroscopically normal or not?
    - Offensive discharge?
    - Presence of necrotic cervical tissue/ cervical trauma?
      → If there are products in the os, gently remove it with ovum forceps; especially if there are signs of shock as this might contribute to cervical or haemorrhagic shock.
  - Bimanual examination:
    - Check for cervical excitation tenderness, the size of the uterus, any adnexal masses or tenderness
- Determine correct gestation by ultrasound (CRL, GS size), and diagnose type of miscarriage as per ultrasound criteria with transvaginal scan. It is advisable to obtain a second opinion on ultrasound when diagnoses of early pregnancy loss (Missed miscarriage/delayed miscarriage or Empty sac) to ensure no false positives of an otherwise viable pregnancy or otherwise a repeat scan should be considered in 7 days.
- Extra investigations
  - Ward Hb

- If rapid Rhesus status is negative then blood for Rhesus antibodies should be taken in ALL pregnant women to asses prior sensitization Give 50µg (250iu) Anti-D Immunoglobulin if Rhesus negative with no antibodies present in cases of ectopic, surgical evacuation, medical evacuation and complete miscarriages after 12wk 0/7. A dose of 100µg (500iu) can also be given if unable to split the ampule BUT this dose must be given if >20wks. ONLY spontaneous, complete miscarriages <12wk DO NOT require ant-D Immunoglobulin A Kleihauer test for fetal maternal haemorrhage is not necessary in the first trimester.
- βHCG if pregnancy of unknown location

DETERMINE IF IT IS A *SAFE/STABLE* OR *UNSAFE/UNSTABLE* MISCARRIAGE:

ANY ONE of the following criteria indicates an unstable patient/unsafe miscarriage	
Vital signs	Temperature > 37.5°C Systolic blood pressure < 90mmHg Diastolic blood pressure <50mmHg Heart rate >90 beats per minute Respiratory rate > 20 per minute
Clinical examination:	Uterus > 12w size Foul smelling discharge/products of conception Clinical signs of infection Organ dysfunction or shock
Investigations	Haemoglobin < 10 g/dl

MANAGEMENT OF UNSAFE MISCARRIAGES

Unstable patient with incomplete miscarriage or delayed miscarriage:

- **Investigations and Interventions will be dependent on whether there is sepsis or haemorrhagic shock**
- Get IV access.
- Do arterial blood gas, full blood count, creatinine and electrolytes if septic or shocked
- Do blood culture, midstream urine culture, if source of sepsis unclear /unknown
- Consider Chest X-ray if clinically indicated.
- Start IV fluid resuscitation with crystalloids.
- Start IV antibiotics if septic:
  - 3rd generation cephalosporin, e.g. Ceftriaxone 1g daily OR Ampicillin 2g 6 hourly OR Clindamycin 600mg 8 hourly intravenously
    PLUS
    Metronidazole 500mg 8 hourly intravenously or 400mg 8 hourly orally
    PLUS
    Gentamicin 5-6mg/kg daily intravenously (ensure normal creatinine)
- Patient must be reviewed by a registrar within 1 hour after presentation and booked for Manual Vacuum Aspiration (MVA)/suction curettage in C2A theatre (haemorrhagic shock) or main theatre (septicaemia). The case must be discussed prior with the anaesthetist
- Only stable/ safe miscarriages can be performed in gynaecology day theatre (GEK).

→If there is ONLY a Vaginal discharge, no clinical signs of sepsis :
• **Give Doxycycline 100mg twice daily orally for 7 days (if the pregnancy is viable, give Azithromycin 1g single dose orally instead)**
PLUS
Cefixime 400mg single dose orally OR Ceftriaxone single dose 250mg intramuscularly
PLUS
Metronidazole 2g single dose orally

MANAGEMENT OF SAFE MISCARRIAGES

- Explain risks and benefits of each management option i.e. expectant, medical and surgical (see table below)
- Obtain consent and document patient choice
  Give contact number of C2A and inform of 24 hour availability of the emergency center.

Early Pregnancy loss (Missed miscarriage/delayed miscarriage or Empty sac)

- Expectant management – Success rate 28- 76%
  - Ensure patient is **stable/safe.**
  - Follow up in 1-2 week (Tuesday walk-in clinic) unless heavy or prolonged bleeding in the interim.
  - Rescan if still bleeding or bleeding has not yet started. If patient had passed products and stopped bleeding, a scan is not needed.
  - If GS still seen or endometrium >15mm, offer Surgical Evacuation or medical management. If the patient declines this: rescan 2 weekly until complete, if patient remains stable and is willing to continue expectant management.
  - If pregnancy test still positive on DC from TBH: Pregnancy test in local clinic 3 weeks later. Return to TBH if positive. **(This is to ensure that no molar pregnancy or ectopic pregnancy is missed)**

- Medical management – Success rate 52-92%
  - Ensure patient is **stable/safe** and that there is **NO contraindication** to misoprostol (see table below).
  - Advice about bleeding/infection.
  - Remove IUCD if in situ.
  - Give **misoprostol 800 micrograms** sublingually. Inform the patient to return the following day (to C2A Emergency Center) if bleeding did not occur. Patient can be given another dose of 800 micrograms sublingually 24h after first dose if no bleeding has occurred.
  - Follow up in 1-2 week (Tuesday walk-in clinic) unless heavy or prolonged bleeding in the interim.
  - Rescan if still bleeding or bleeding has not yet started. If patient had passed products and stopped bleeding, a scan is not needed
  - If GS still seen or endometrium >15mm, offer Surgical Evacuation. If the patient declines this, offer repeat medication or expectant management and rescan 2 weekly until complete, if patient remains stable and is willing to continue.
  - If pregnancy test still positive on DC from TBH: Pregnancy test in local clinic 3 weeks later. Return to TBH if positive

- Surgical management – Success rate 95-100%
  - Check Hb and Rhesus.
  - Book patient with GEK or main theatre for a manual vacuum aspiration (MVA) and inform the on-call gynaecology registrar. Any suitably trained health professional can perform the procedure.
  - Assess need for cervical priming
    - Misoprostol 400µg sublingually 2-3 hours before MVA.
    - Can repeat Misoprostol 200µg micrograms once 4-6 hours later if the cervix is still too unfavourable to do MVA.
  - Advise pregnancy test in local clinic 3 weeks later. Return to TBH if positive. **(This is to ensure that no molar pregnancy or ectopic pregnancy is missed)**

Incomplete miscarriage

- Surgical management - Success rate 95-100%
  - Check Hb and Rhesus

- Book patient with GEK or main theatre and inform on-call gynaecology registrar. Any suitably trained health professional can perform the procedure.
- Assess need for cervical priming
  - Misoprostol 400µg sublingually 2-3 hours before MVA
  - Can repeat Misoprostol 200µg micrograms once 4-6 hours later if the cervix is still too unfavourable to do MVA
- Advise pregnancy test in local clinic 3 weeks later. Return to TBH if positive. **(This is to ensure that no molar pregnancy or ectopic pregnancy is missed)**

- Expectant management – Success rate 80-94%
  - Ensure patient is **stable/safe**
  - .
  - Follow up in1- 2 weeks (Tuesday walk-in clinic) unless heavy or prolonged bleeding in the interim. Rescan if still bleeding or if bleeding has not occurred. If endometrium >15mm, offer Surgical Evacuation or Medical management. If the patient declines this: rescan 2 weekly until complete, if patient remains stable and is willing to continue expectant management.
  - If pregnancy test still positive on DC from TBH: Pregnancy test in local clinic 3 weeks later. Return to TBH if positive

- Medical management – Success rate 70-96%
  - Ensure patient is **stable/safe** and that there is **NO contraindication** to misoprostol (see table below)
  - Consent (explain risks as per Table 3)
  - Advise about bleeding/infection.
  - Remove IUCD if in situ
  - Give **misoprostol 600 micrograms** SL as single dose. Patient can be given another dose of 600 micrograms sublingually 24h after first dose if no bleeding has occurred.
  - Follow up in 1-2 week (Tuesday walk-in clinic) unless heavy or prolonged bleeding in the interim.
  - Rescan if still bleeding or bleeding has not yet started. If patient had passed products and stopped bleeding, a scan is not needed
  - If endometrium >15mm, offer Surgical Evacuation. If the patient declines this offer repeat medication or expectant management and rescan 2 weekly until complete, if patient remains stable and is willing to continue.
  - If pregnancy test still positive on DC from TBH: Pregnancy test in local clinic 3 weeks later. Return to TBH if positive

The reason for difference in doses of misoprostol between Early Pregnancy Loss (Delayed/ Missed/ Empty sac) and Incomplete miscarriage is that the effectiveness of lower dose misoprostol in delayed miscarriage is lower, according to Cochrane reviews.

Complete miscarriage

- A diagnosis of a complete miscarriage can **only** be made when a prior intrauterine pregnancy was seen on ultrasound, OR the fetus was visualized by patient (after passing it vaginally) or staff OR visualization of products of conception by attending doctor (need to differentiate from blood clots or decidua by clearly identifying villi).
- If this is not the case, ectopic pregnancy needs to be ruled out by a formal scan in the ultrasound department and, following this, it has to be called 'pregnancy of unknown location' and followed up with serum human chorionic gonadotrophin (βHCG).
  - Do urine βHCG on presentation.
    - If negative and patient has a history of abnormal uterine bleeding further investigation is required with follow up at the gynaecological clinic.
    - If positive, draw serum βHCG.
      - If <5 IU/L, patient can be discharged/ referred to gynae clinic
      - If >5IU/L, arrange for a second βHCG to be drawn as per Pregnancy of Unknown Location (PUL) protocol, and follow up accordingly.(**Refer to**

Ultrasound Assessment of possible Ectopic Algorithm displayed in C2A admissions and Gynae clinic)

FOLLOW-UP

- Expectant management: follow-up time of **one to two weeks** has been found to be acceptable to patients and result in a 99% rate of complete miscarriage. Patient to come to firm clinic day (appointment only) or to the Tuesday walk-in clinic. (Patient remains under initial Firm responsibility if MVA required). Ensure that there is a management plan in the folder.
- Medical management: **one to two weeks** follow-up time is acceptable and will increase the success rate (success implying complete miscarriage) compared with very short intervals such as 24h. Patient to come to firm clinic day or to the Tuesday walk-in clinic. (Patient remains under initial Firm responsibility if MVA required)
- Surgical management: only follow up **as per patient need**.
- For all patients: **open door policy** to C2A admissions in cases of prolonged bleeding, high temperature, foul smelling discharge etc.
- Patients should be advised to take a **pregnancy test 3 weeks after** completion of treatment to ensure no ectopic or molar pregnancy is missed. Can be done by local clinic.
- All patients should have their **fertility plans** and **family planning method** assessed, and documented, and offered a visit to a family planning clinic after completion. Consider providing a family planning method prior to completion when offering expectant or medical management of miscarriages as ovulation can occur at 10 days post first trimester miscarriage. Otherwise advise condom usage until miscarriage ascertained as complete.

COUNSELLING

Expectant management involves allowing spontaneous passage of retained products of conception in an unprovoked way, i.e. “letting nature take its course”.

Medical management uses drugs like misoprostol, to aid expulsion of retained products.

Surgical management involves taking the patient for a surgical procedure under local anaesthetic to empty the uterine cavity; this can either be a manual vacuum aspiration or suction curettage.

Explain logistical barriers that may influence patient choice eg limited access to after hour theatre facilities in case of unscheduled evacuation required for heavy menstrual bleeding and the ability of the patient to return if heavy bleeding occurs

Risks and benefits of methods			
	Expectant	*Medical*	*Surgical*
Benefits	• Avoids surgical and anaesthetic risk • Allows women to continue daily routine • More acceptable to some women	• Avoids surgical and anaesthetic risk • Faster resolution compared with expectant management	• Planned and predictable treatment • High success rate • Essential in unstable patient
Risks	• May have more prolonged bleeding or infection • Timescale and outcome not always predictable • 21-59% may need surgical evacuation • Risk of unscheduled evacuation if heavy bleeding occurs and the limited availability of theatre after hours at Tygerberg Hospital	• Greater analgesic need • More vaginal bleeding • Possible need for surgical evacuation in up to 30-40% of cases • Risk of unscheduled evacuation if heavy bleeding occurs and the limited availability of theatre after hours at Tygerberg Hospital • Side effects of misoprostol: diarrhea, vomiting etc.	• Need for anaesthesia if unstable and needing GA • Risk of uterine perforation and cervical trauma, and intrauterine adhesions
Absolute contra-indications	• Heavy vaginal bleeding (two pads soaked in an	• Heavy vaginal bleeding (two pads soaked in an hour and	

	hour and then another two pads are soaked in the next hour) or haemodynamic instability • Anaemia <10g/dl • Signs of infection (T>37.5, HR>90, foul smelling discharge) • Suspected ectopic	then another two pads are soaked in the next hour or haemodynamic instability • Anaemia <10g/dl • Signs of infection (T>37.5, HR>90, foul smelling discharge) • Suspected ectopic • Adrenal insufficiency • Long term steroid therapy • Porphyria • Mitral stenosis • NSAID ingestion <48h • Haemoglobinpathy • Anticoagulant therapy • Allergy to misoprostol	
Relative contra-indications		• Hypertension • Severe asthma • IUCD (remove first)	

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Signed: GS Gebhardt
Head: General Specialist Services; Obstetrics and Gynaecology

Appendix 2

TYGERBERG HOSPITAL
Department of Obstetrics and Gynaecology: General Specialist Services

Early Pregnancy Assessment Checklist

Patient sticker

Name_____

Folder Number_____

Presenting complaint……
……
……
……

Patient information		
Age		
Gravidity		
Parity		
Date of LMP		
Regular cycles	Yes	No

Vital signs			
Blood pressure			mmHg
Heart rate			per minute
Temperature			°Celsius
Respiratory rate			per minute
Rhesus	Positive	Negative	Unknown

Examination		
Cardiovascular		
Respiratory		
Abdomen		
Speculum	Cervix open	Cervix closed
Discharge	Yes	No
Products	Yes	No
Bimanual	Uterine size	weeks

Tests		
Urine dipsticks		
Pregnancy test	Positive	Negative

Haemoglobin			g/dl
HIV result	Positive	Negative	Unknown
If HIV+, on HAART?	Yes	No	

Ultrasound report

Uterine content					
Gestational sac	**Seen**		**Not seen**	**Number of sacs**	
Location of sac	Corpus, central		Corpus, excentric	Cornu	Cervix
Sac diameters	……..mm	……..mm	……..mm	**Mean:**	……..mm
Double decidual sign	Yes	No	Unsure		
Sac content	Empty	Yolk sac	Embryo	Unsure	
Sac contour	Regular		Irregular		
Embryo	**Seen**	CRL……mm	FHR ……..bpm	**Not seen**	
Other uterine cavity content	Empty	Fluid	Tissue	AP diameter	.....mm
Para-uterine findings					
Free fluid in POD	No	**Yes**	Depth……..mm	Clear	Turbid
Left Ovary	Normal	Corpus luteum	Mass:		
Next to left ovary	No mass	Mass	Describe and measure		
Right Ovary	Normal	Corpus luteum	Mass:		
Next to right ovary	No mass	Mass	Describe and measure		
Conclusion - Working diagnosis					

Intrauterine Pregnancy Assessment:	Viable Pregnancy*	Pregnancy of uncertain viability	Early pregnancy loss (<13w0d)	Late pregnancy loss (≥13w0d)*	Molar Pregnancy
Miscarriage Assessment:	Incomplete		Complete Miscarriage		Septic Miscarriage
Extra uterine pregnancy assessment:	Possible ectopic		Certain ectopic~		
Pregnancy of unknown location and Other (describe):					

Appendix 3