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# All CABG Patients Who Have No Contraindications: Do They Get Perioperative Beta Blockers?

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## Abstract

New-onset postoperative atrial fibrillation (POAF) following Coronary artery bypass graft (CABG) surgery has been described in up to 15% to 40% of patients in the initial postoperative period. POAF is related with higher mortality, increased hospital resource utilization, postoperative extra ITU hours and hospital days, consequently increasing hospital-related budgets. Beta blocker administration decreases the rate of POAF from 30% - 40% to 12% - 16% after CABG. According to the EACTS (European Association of Cardiothoracic Surgery) guideline December 2006,  $\beta$ -Blockers should routinely be used as the first choice for the prophylaxis of atrial fibrillation (AF) in all patients undergoing cardiac surgery, if not contraindicated (IB). To compare the contemporary practice with the recommended standard retrospective data of consecutive 400 patients treated with isolated CABG between July 2015 and June 2017 were collected. Those patients who received  $\beta$ -blockers on the day of surgery or the following morning (Continued and Restarted on 1st POD) met the standard guidelines. Thus, according to the data (12% + 20%) 32% of the patients met the standard. To compare the rate of Postoperative Atrial fibrillation, we divided the patients into two groups. Group A, who followed the guideline (128 patients) and Group B, who resumed  $\beta$ -Blockers 48 hours onwards (272 Patients). In group A, only 8 patients developed postoperative AF whereas in group B 88 patients developed postoperative AF which is also statistically significant ( $P < 0.003$ ).  $\beta$ -blockers significantly decrease the incidence of AF after CABG. Attention must also be paid on understanding and improving  $\beta$ -blockers use at perioperative period.

## Keywords

CABG-Coronary Artery Bypass Graft,  $\beta$ -Blockers, AF-Atrial Fibrillation, POAF-Postoperative Atrial Fibrillation

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## 1. Introduction

Atrial Fibrillation (AF) is the most common arrhythmia happening after cardiac surgery and its occurrence peaks between second or third postoperative day. Postoperative AF varies depending on types of surgery. Particularly, AF occurs in nearly 30% of patients undergoing CABG, and in 40% and 50% of patients after valve surgery alone or combined valve and CABG surgery correspondingly. AF has been stated in up to 15% to 40% of patients in the initial postoperative period after Coronary artery bypass graft surgery (CABG) [1]. New-onset POAF following CABG is often self-limiting; nevertheless, it may necessitate anticoagulation therapy and either a rate or rhythm control approach. Postoperative atrial fibrillation (POAF) is related with higher mortality, increased hospital resource utilization, postoperative extra ITU hours and hospital days, consequently increasing hospital-related budgets [2]. In patients undergoing CABG, the constant use of  $\beta$ -blockers was related with a lower risk of long-term mortality and complex cardiac and cerebrovascular events. Beta blocker administration lowers the incidence of POAF from 30% - 40% to 12% - 16% following CABG [3].

## 2. Purpose

In the European Society of Cardiothoracic Surgery 2006 guidelines, the perioperative use of  $\beta$ -Blockers is suggested as the first choice in all patients undergoing CABG, unless otherwise contraindicated. The 2004 ACC/AHA guidelines update on CABG gave a class I recommendation to preoperative or initial postoperative beta blocker therapy in patients without a contraindication [4]. If the patient is on  $\beta$ -Blockers, this must be continued up to the morning of surgery and restarted on the first postoperative day [5]. Our audit objective was to find out any perioperative period in which patient was not on  $\beta$ -Blockers, if there was any, to compare with the standard.

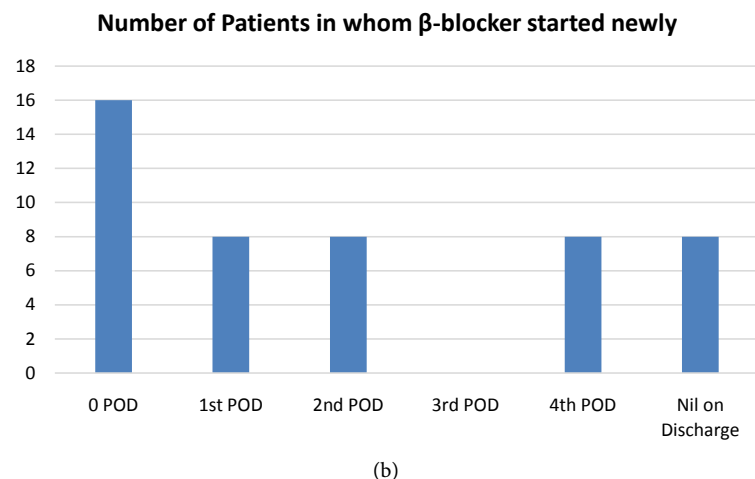
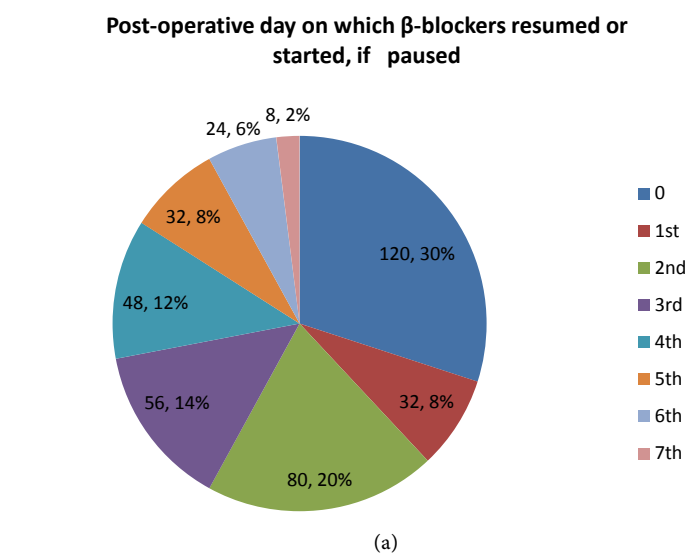
## 3. Patients and Methods

We conducted a retrospective Cohort study. Retrospective data were collected for consecutive 400 patients over 2 years via PICs system (Hospital's internal computer soft wear system for keeping the record of the patients). Patients who underwent isolated CABG were included. Patients who had contraindications to  $\beta$ -blocker therapy like Asthma, Bradycardia (Heart rate < 60 beats/minute), 2nd or 3rd degree heart block or who underwent CABG combined with other cardiac procedure (like valve surgery) were excluded. Consecutive 400 patients treated

with isolated CABG between July 2015 and June 2017 were included and 66 patients were excluded as they had physician-documented contraindications to  $\beta$ -blocker therapy, or underwent CABG combined with valvular or other cardiac surgery [6].

#### 4. Results

According to the standard guidelines all patient undergoing CABG should receive  $\beta$ -blockers on immediate postoperative period, which is within 24 hours.  $\beta$ -Blockers were continued peri-operatively only in 12% patients. However, in 20% patients it was resumed in 1st postoperative day. In 48% patients,  $\beta$ -Blockers were resumed on 2nd postoperative day (Table 1). According to the data (12% + 20%) 32% of the patients met the standard guideline (Figure 1(a)).



**Figure 1.** (a) Pie chart and bar chart showing post-operative day on which  $\beta$ -blockers resumed or started, if paused (NB: 8 patients were excluded from the above chart as they were not treated with beta blocker in the pre-, peri- or post-operative periods). (b) Day beta-blocker commenced post-operatively on those not admitted on a  $\beta$ -blocker (8 patients were discharged without commencing  $\beta$ -blocker).

**Table 1.** Number of patients and the time of their  $\beta$ -blockers commencement.

Day on which $\beta$ -blockers (resumed/started, if paused)	Number of patients	Percentage
Continued	48	12%
Restarted 1st POD	80	20%
Restarted 2nd POD	192	48%
Restarted 3rd POD	32	8%
Restarted 4th POD	16	4%
Restarted 5th POD	8	2%
Restarted 6th POD	0	0%
Restarted 7th POD	8	2%
Restarted 8th POD	8	2%
Nil on discharge	8	2%
Total	400	100%

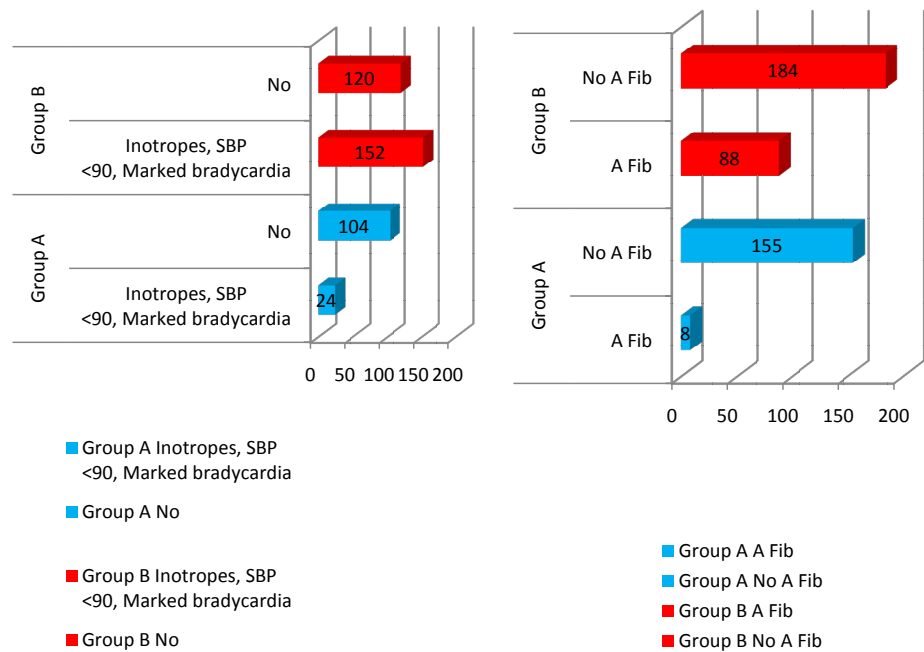
To compare the rate of Atrial fibrillation, we divided the patients into two groups. Group A, who followed the guideline (128 patients) and Group B, who resumed  $\beta$ -Blockers 48 hours onwards (272 patients) (**Figure 2**). In group A, only 8 patients developed postoperative AF whereas in group B 88 patients developed postoperative AF which is also statistically significant ( $P < 0.003$ ).

## 5. Discussion

Pathophysiologic parameters such as the atypical electrophysiological state of the atria, the unequal shortening of the atrial myocytes refractory period and variable conduction speed over the atrial tissue predispose the development of AF. Risk factors of postsurgical AF could be divided into: preoperative, intra-operative and postoperative. Preoperative factors primarily consist of 1) atrial tissue damages due to age, prior rheumatic fever, raised left ventricular diastolic pressure, hypertension and coronary syndromes; 2) heart diseases like left ventricular hypertrophy, left atrium enlargement or history of congestive heart failure; 3) electrolytic imbalance explicitly hypokalemia, hypomagnesemia; 4) hypothyroidism and 5) preoperative usage of digoxin or milrinone. Lastly, obesity, male gender, chronic obstructive pulmonary disease (COPD), tachycardia, prolonged P-wave deviation might also influence AF. While, intra-operative risk factors could be due to increased sympathetic activation from stimulation of catecholamines, reflex sympathetic stimulation after volume loss, anemia, pain, use of adrenergic drug, aortic cross clamping time, early reversal of atrial electrical activity after cardioplegia, bi-caval venous cannulation, left ventricular venting through pulmonary vein and extracorporeal circulation.

Shortening of atrial refractoriness increases AF and prolonging refractoriness reduces AF. Shorter atrial refractory periods seemingly shorten the wavelength (defined by [conduction velocity]  $\times$  [refractory period]) and therefore stabilize the multiple re-entrant wavelets that spread AF. Class IA and class III agents are





**Figure 2.** Bar charts showing different groups and postoperative onset of AF among them. Group A:  $\beta$ -blockers Continued or Started/Restarted on 1st POD (16 Patients). Group B:  $\beta$ -blockers Started/Restarted 2nd POD onwards (34 Patients).

thought to protect against AF by prolonging atrial refractoriness. Even though beta-blockers are not usually observed as membrane stabilizing agents, they may defend against AF by delaying atrial repolarization. Kühlkamp *et al.* mentioned that beta-blockers protect against adrenergically facilitated shortening of the action potential duration which is believed to precipitate and maintain AF.

Several pharmacologic approaches attempt to diminish the incidence of postoperative AF. Overall, most reported studies determine a positive effect with various pharmacologic agents such as  $\beta$ -blocker, amiodarone, calcium blocker, magnesium. Nevertheless, no single agent or combination of particular agents has completely eliminated post cardiac surgery AF. Beta blockers have been an option in the control of ventricular response in AF for several years. Randomized studies have established the superiority of beta-blockers in controlling the ventricular response. Beta-blockers usually have not been considered to be atrial stabilizing agents apart from two distinct situations. First, a small number of patients experience recurrent AF in association with stress or anxiety; these patients might respond well to beta-blockade. Second, and more commonly, the use of beta-blockers for prevention of AF in patients after cardiothoracic surgery, in which AF occurs in approximately 30% of patients. The advantages of the use of beta-blockers are highest in patients who formerly have received beta-blockers, even though a drop in AF is seen also in patients not formerly receiving beta-blockers. The efficacy of beta-blockers in this context likely relates to the raised sympathetic tone present postoperatively.

All known meta-analyses demonstrated that b-blockers significantly reduced

the incidence of POAF. Mainly, Andrews *et al.*, presented that the incidence of post-CABG AF reduced from 34% to 8% in patients received b-blockers. In another meta-analysis of Kowey *et al.*, the reduction in incidence of AF was from 20% to 8%. However, Crystal *et al.* completed the largest meta-analysis based on 27 randomised controlled trials that involved 3,840 patients. Particularly, the control group presented an incidence of AF almost 33%, while markedly patients receiving b-blockers had an incidence of 19%.

According to the ESC guideline August 2009,  $\beta$ -Blockers recommended in patients with recognized ischaemic heart disease or myocardial ischaemia on preoperative testing (IB). According to the EACTS guideline December 2006,  $\beta$ -Blockers should routinely be used as the first option for the prophylaxis of AF in all patients undergoing cardiac surgery, unless otherwise contraindicated (IB). So, those patients who received  $\beta$ -blockers on the day of surgery or the following morning (Continued + Restarted immediately on 1st POD) met the standard guidelines. Thus, according to the data (12% + 20%) 32% of the patients met the standard guideline (**Figure 1(a)**). It can be said that Standards were met partially. To compare the rate of Atrial fibrillation, we divided the patients into two groups. Group A, who followed the guideline (128 patients) and Group B, who resumed  $\beta$ -Blockers 48 hours onwards (272 Patients) (**Figure 2**). In group A, only 8 patients developed postoperative AF whereas in group B 88 patients developed postoperative AF which is also statistically significant ( $P < 0.003$ ).

## 6. Study Limitations

The limitation of this study was that the comorbidities (like COPD) and electrolyte imbalance were not considered as a probable cause of AF because the initial aim was to find the number of the patients who did not receive  $\beta$ -Blockers perioperatively rather than the number of the patients who developed POAF.

## 7. Conclusion

In patients undergoing CABG, the constant usage of  $\beta$ -blockers is associated with a lesser risk of long-term mortality. From the result of our review it can be said that standards were met partially. The number of POAF was significantly higher in the group who did not receive perioperative  $\beta$ -blockes. Attention must also be paid on understanding and improving  $\beta$ -blocker use at perioperative period.

## Recommendation

All patients undergoing CABG should continue  $\beta$ -blockers in the perioperative period to reduce the chance of postoperative atrial fibrillation. Future studies in a larger scale considering other cofounders including COPD and electrolytes imbalance are recommended.

## Conflicts of Interest

The authors report no conflicts of interest in this work.

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# Profile of Gynaecological Malignancies in Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Southeastern Nigeria

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## Abstract

**Background:** Comprehensive estimates of the incidence of gynaecological malignancies reported from Nigeria are very limited due to limitation in record maintenance. Female cancer is a public health problem the world over. The malignancies of the female genital organs are major causes of morbidity and mortality which necessitates data for policy formulation and health planning. **Aim:** To establish the profile of gynaecologic malignancies reported in our centre, with reference to incidence, histological subtypes and frequency of involvement at various sites and to compare the procured data with those from other national and international centers. **Materials and Method:** In this descriptive retrospective study, the records pertaining to all the pathological specimens categorized as gynaecological malignancies from January 1st, 2013 to December 31st, 2015 at our facility were studied and compared with the available international data. Data analysis was done using Epi Info software version 7.2.1 (CDC Atlanta Georgia). **Result:** Two hundred and eleven (211) cases of gynaecological malignancies were seen during the study period and this constituted 13.4% of gynaecological admissions. Cervical malignancies were the commonest constituting 49.2% of all gynaecological malignancies followed by ovarian malignancies (27.8%), endometrial cancers (11.9%), vulva (5.6%), choriocarcinoma (3.9%) and vagina (1.6%). The data obtained was compared with data from Surveillance, Epidemiology and End Result (SEER) programme in the United States and European Union. All malignancies except cervical cancers affected a younger age group at our centre. Cervical cancers presented at a relatively more advanced stage, Ovarian cancers were more localized, whereas uterine, vulva and vaginal cancers presented at a similar stages as compared to Western data. **Conclusion:** This study presents a composite data of Gynaecological malignancies from Southeast Nigeria. Ad-

vanced stage of presentation of cervical cancers suggests lacunae in screening programmes available. Compared with Western data, ovarian malignancies were more localized at presentation for which environmental or genetic factors may be responsible.

## Keywords

Profile, Gynaecological, Malignancies, Abakaliki, Nigeria

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## 1. Introduction

Gynaecological cancers form a huge burden of morbidity and mortality around the world [1]. Data available from various centres worldwide are indicative of vast regional variability in incidence, common site of occurrence, age and stage of presentation [2]. While information on such issue is readily available from the developed world, composite data from Nigeria are deficient [3].

Cancer is a public health problem for the world over [4]. Malignancies of the female genital organs are major causes of morbidity and mortality [5]. This is particularly so in the developing countries where there are poor awareness and late presentation [6]. Worldwide, gynaecological cancers account for about 10% of new cancer cases in women and 12% of cancer deaths [6]. The incidence of gynaecological malignancies has decreased drastically in developed countries due to organized screening programs [7]. However, in Sub-Saharan Africa, squamous cell carcinoma of the cervix accounts for the largest proportion of genital tract cancers [8].

Endometrial carcinoma has become the most common gynaecological malignancies in North America and Northern Europe while it is less commonly seen amongst black women [9]-[20]. Ovarian cancer is one of the common gynaecological malignancies with considerable geographical variation, the incidence in the highest risk countries being 5 times greater than that in the lowest risk countries [10]. It is the leading cause of mortality of female gynaecological cancers and ranks seventh as the most common cancer worldwide [11]. The increasing life expectancy has led to increase in its burden exponentially now even in developing countries but limited knowledge is there about the pattern of ovarian tumours [12]. There is scanty literature on the current state of ovarian cancer in Nigeria. Cervical cancer is the most common cause of cancer-related death in the developing countries because of poor cervical cancer screening programs in these countries [12] [13] [14] [15]. Vulval and vaginal cancers are rare with peak incidence in the 6th decade of life [16]-[25].

There has been limited recent information on the profile of gynaecological cancers in Abakaliki, hence the decision to carry out this study to determine the profile of gynaecological malignancies in Alex Ekwueme Federal University Teaching Hospital Abakaliki, as this could have significant implications on health planning and policy decisions. Therefore, the aim of this study was to establish

the profile of gynaecologic malignancies managed in our centre, with reference to sociodemographical data, histological subtypes and frequency of involvement at various sites and to compare the procured data with those from other national and international centres.

## 2. Materials and Method

**Study Area:** Alex Ekwueme Federal University Teaching Hospital (formerly known as Federal Teaching Hospital) Abakaliki is a tertiary hospital within Abakaliki metropolis. The hospital is made up of ten clinical departments; Obstetrics and Gynaecology, Paediatrics, Medicine, Surgery, Psychiatry, Community Health, Family Medicine, Ophthalmology, ENT and Anesthesiology. Department of Obstetrics and Gynaecology is 1 of the 10 clinical departments in the hospital, it has ten teams with each comprising consultants, senior registrars, registrars, senior house officers and house officers. The department runs gynaecological clinics, preconception, antenatal, intrapartum, and postnatal services. It is also a referral centre to the surrounding maternities and hospitals and also receives referral from surrounding states; Cross Rivers, Enugu, and Benue states. Patients with gynaecological malignancies are referred from all these places to the hospital.

**Study Design:** This was a retrospective descriptive study of the profile of gynaecological malignancies in Alex Ekwueme Federal University Teaching Hospital Abakaliki over a three year period. The case files of all women managed for gynaecological malignancies at the hospital from 1st January, 2013 to 31st December, 2015 was retrieved from the Medical Records Department, and information was also obtained from admission records in Gynaecological ward, record of Operations at the Theatre, and also from the record of histological report of samples of all cases of gynaecological malignancies analyzed at the Histopathology department of the hospital. The inclusion criterion was women with diagnosis any of the type of gynaecological cancers confirmed by histology. Data were extracted pertaining socio-demographic and gynaecological characteristics including age, parity, and occupational status, presenting symptoms, risk factors for malignancy, organ of involvement, provisional diagnosis and histopathological diagnosis.

**Data Analysis:** Data collection was done using a pre-designed proforma. Data analysis was done using Epi Info software (7.2.1 CDC Atlanta Georgia). The results were expressed as frequency tables, percentages, mean and standard deviation. Associations between categorical data were analyzed using  $X^2$ , with a p-value of 0.05 considered statistically significant.

**Ethical Consideration:** Permission to carry out this research was sought and obtained from the Research and Ethical Committee of the Alex Ekwueme Federal University Teaching Hospital Abakaliki.

## 3. Results

During the study period, 1570 women were admitted into the gynaecological

ward. Two hundred and eleven (211) had gynaecological cancers from the admission records. This gave the proportion of gynaecological cancer of 13.4% of gynaecological admissions. One hundred and sixty two (162) case notes were retrieved giving a retrieval rate of 76.78% and 126 of these retrieved case notes had complete records including histological diagnoses. Percentage of case notes containing all information was 77.78%. The sites of involvement included the cervix (62), ovary (35), corpus uteri (15), vulva (7), choriocarcinoma (5) and vagina (2).

**Table 1** showed the socio-demographic data of patients with gynaecological malignancies. The mean age of women who had cervical carcinoma ( $51.8 \pm 4.9$  years) was higher than that of those with ovarian and endometrial cancer ( $50.3 \pm 6.1$  years and  $50.7 \pm 6.1$  years respectively) but was lower than those with vulva ( $67.8 \pm 2.7$  years) and vagina ( $68.0 \pm 1.0$  years) cancers. The mean age of patients with choriocarcinoma ( $31.7 \pm 3.2$  years) was lowest. Half of cases of cervical cancer (31 out of 62) were aged 55 - 74 years and one patient was aged 84 years. The same trend was observed in other gynaecological malignancies and the two cases of vaginal cancer were in 55 - 74 years age group. Low frequencies of gynaecological malignancies were observed in patients between the ages of 15 years to 34 years (9 cases of cervical cancer, 6 cases of ovarian, 2 cases of endometrial cancers and 3 cases of choriocarcinoma). None of the patients between the ages of 15 to 54 years had either vulva or vagina cancer. The mean parity for patients with cervical cancer ( $6.4 \pm 0.6$ ) was higher than those of ovarian cancer ( $3.8 \pm 1.2$ ), endometrial cancer ( $3.9 \pm 1.1$ ), choriocarcinoma ( $3.5 \pm 2.3$ ) and vulva cancer ( $5 \pm 1$ ). There is an increase in incidence of cervical cancer with increasing parity but this was not statistically significant ( $P = 0.2324$ ). In patients with endometrial, ovarian, choriocarcinoma, vulva and vaginal carcinomas, there was no significant increase in incidence of cancers with increasing parity and the relationships were not statistically significant ( $P > 0.05$ ). None of the patients seen used tobacco in any form.

As shown in **Table 2** and **Table 3**, sixty two (49.2%) patient had cervical cancer

**Table 1.** Socio-demographic characteristics of patients with gynaecological malignancies.

Parameters	Cervical	Ovarian	Endometrial	Choriocarcinoma	Vulva	Vaginal
Age						
15 - 35	9	6	2	3	0	0
35 - 54	21	13	6	2	0	0
55 - 74	31	16	7	0	6	2
75 - 84	1	0	0	0	1	0
Mean Age	$51.8 \pm 4.9$	$50.3 \pm 6.1$	$50.7 \pm 6.3$	$31.7 \pm 3.2$	$67.8 \pm 2.7$	$68.0 \pm 1.0$
Parity						
0	0	3	1	0	0	0
1 - 4	20	25	10	4	3	1
5 - 10	42	7	4	1	4	1
Mean Parity	$6.4 \pm 0.6$	$3.8 \pm 1.2$	$3.9 \pm 1.1$	$3.5 \pm 2.$	$4.0 \pm 1.0$	$9.0 \pm 1$
P Value	0.2324	0.3208	0.6537	30.5432	0.7108	0.2978

**Table 2.** Stage at presentation and Histological subtype of gynaecological malignancies (stage according to FIGO classification).

Stage	Cervix			Ovary			Uterus		Vulva	Vagina	Total
	SCC	Adeno	Epith	Germ	Stroma	Epith	Mesen	Chorio	SCC	SCC	
1	13	3	3	4	2	1	2	2	0	0	30
2	8	1	8	3	1	3	1	1	2	1	29
3	18	1	11	1	0	6	0	1	2	1	41
4	18	0	1	1	0	2	0	1	3	0	26
Total	62			35			20		7	2	126

SCC= squamous cell carcinoma; Adeno = adenocarcinoma; Epith = epithelial cancers; Mesen = mesenchymal cancer; Germ = germ cell cancers; chorio = choriocarcinoma.

**Table 3.** Sites of involvement and median age of patients compared with international data [2] [24] [25] [26] [27].

Site	AEFUTHA		SEER		European Union		Indonesia		India	
	% Cases	Median Age	% Cases	Median Age	% Cases	Median Age	% Cases	Median Age	% Cases	Median Age
Cervix	49.2	51	16.24	48	18.28	NA	75.00	NA	71.5	50
Ovary	27.8	45	26.95	63	36.34	NA	19.63	NA	15.11	45
Uterus	15.9	50	49.14	65	38.92	NA	4.2	NA	9.95	52
Vulva	5.6	68	4.67	68	5.16	NA	0.68	NA	2.7	60
Vaginal	1.6	74	1.48	68	1.29	NA	0.46	NA	0.7	50

AEFUTHA = Alex Ekwueme Federal University Teaching Hospital, Abakaliki; NA = not available; SEER = surveillance, epidemiology and end result. Median age is expressed in years, % = percentage.

with a median age of 51 years and only 20 patients (32.3% of cervical cases) presented at an early stage and had operative management. The surgical procedures performed included simple hysterectomy in twelve patients and radical hysterectomy with node dissection in eight patients. Five (5) of the 8 patients that had radical hysterectomy with node dissection and 42 patients with advanced cervical cancer were referred for radiotherapy, and only 10 returned for adjuvant chemotherapy. Squamous cell carcinoma is the commonest histological cervical cancer in our centre constituting 91.9% of all cervical cancers and 52.4% of all gynaecological malignancies. Thirty five (35) cases of ovarian cancer were seen during the period constituting 27.8% of all gynaecological malignancies with a median age of 45 years. Epithelial ovarian cancer is the commonest histological ovarian cancer and constituted 65.7% of all ovarian cancers. Majority of epithelial ovarian cancer presented in stage 3 while most of non-epithelial ovarian cancer presented in stage 1. The uterus was the primary site of involvement in 15.9% of cases with a median age of  $50.7 \pm 6.3$  years and a median age of 50 years. Five out of the twenty cases of uterine cancer, constituting 25% of uterine cancer were choriocarcinoma. Seven cases of vulva cancers were seen during the period constituting 5.6% of gynaecological malignancies and with a mean age of  $67.8 \pm 2.7$  years and median age 68 years. The two cases of vagina cancer were



seen in two 68 years old grand multiparous women. All cases of vulva and vagina cancers were squamous cell carcinoma.

The percentage incidence of gynaecological malignancies reported in our centre according to site and age group affected is presented and compared with the international data in **Table 4**. Compared with international data, women < 20 years in our study did not present with gynaecological cancers (**Table 4(a)**). However, there was an increase in incidence of gynaecological cancers as the age increases. In **Figure 1**, the organ of involvement of various gynaecological malignancies was compared with data obtained from other international centers. The line graph showed that the incidence of gynaecological cancers fell in different countries from cervical to vaginal cancers. However, the incidence was lower in our center when compared with other international centers.

#### 4. Discussion

Gynaecological cancers formed 13.4% of gynecological admissions in this study. This is similar when compared with 11.5% reported by Yakasai *et al.* in Aminu Kano University but higher than 5.4% reported in Jos and lower when compared with 17.4% reported by Ozumba *et al.* in Enugu [4] [21] [23]. The profile of gynecological malignancies is different in various geographical areas [21]. Cervical cancer is one of the leading cancers in women worldwide, second only to breast

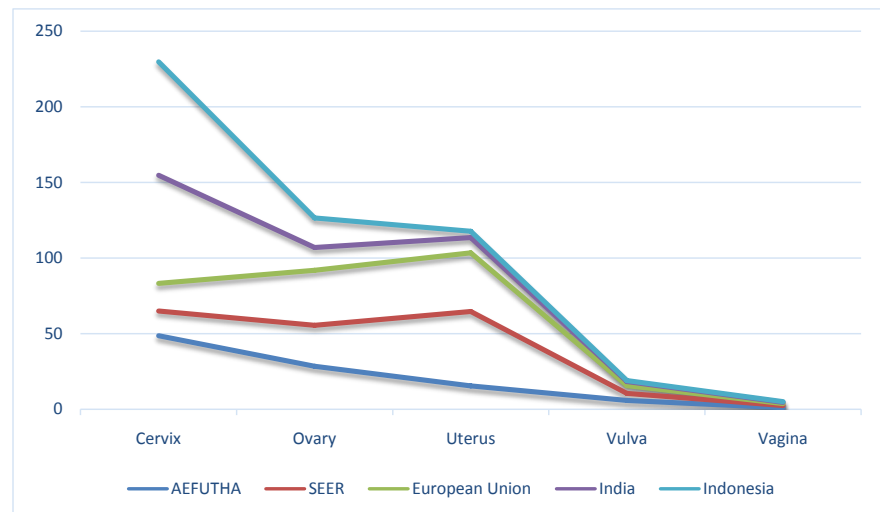
**Table 4.** (a) Age distribution, percentage of incidence, case by site: comparison with SEER [24]. (b) Age distribution, percentage of incidence, case by site: comparison with SEER [24].

(a)												
Site	<20			20 - 34			35 - 44			45 - 54		
	AEFUTHA	SEER	P Value	AEFUTHA	SEER	P Value	AEFUTHA	SEER	P Value	AEFUTHA	SEER	P Value
Cervix	0	0.2	1 (NS)	12.2	14.5	<0.0001 (sig)	19.5	26.1	0.7885 (NS)	14.6	23.7	0.634 (NS)
Ovary	0	1.3	1 (NS)	8.3	3.5	0.6742 (NS)	12.5	7.4	<0.2478 (NS)	25.0	19.2	0.2177 (NS)
Uterus	0	0.1	1 (NS)	7.7	2.1	0.054 (NS)	7.7	5.58	<0.68 (NS)	38.5	17.25	0.0665 (NS)
Vulva	0	1.2	1 (NS)	0	0.9	1 (NS)	0	5.8	1 (NS)	0	14.0	1 (NS)
Vagina	0	0.2	1 (NS)	0	2.2	1 (NS)	0	8.0	1 (NS)	0	16.2	1 (NS)

(b)										
Site	55 - 64			65 - 74			75 - 84			
	AEFUTHA	SEER	P Value	AEFUTHA	SEER	P Value	AEFUTHA	SEER	P Value	
Cervix	31.7	16.3	<0.0001 (sig)	19.5	10.4	<0.001 (sig)	1.6	6.5	0.176 (NS)	
Ovary	41.6	22.9	<0.0001 (sig)	12.5	19.5	0.5020 (NS)	0	18.4	1 (NS)	
Uterus	23.07	25.7	0.3198 (NS)	23.07	20.6	0.575 (NS)	0	17.3	0.109 (NS)	
Vulva	0	21.7	0.208 (NS)	85.7	21.6	0.0002 (sig)	14.3	22.1	1 (NS)	
Vaginal	50.0	17.8	0.117 (NS)	50	17.4	0.11 (NS)	0	24.0	1 (NS)	

NS = not significant, Sig = significant, SEER = surveillance, epidemiology and end result. AEFUTHA = Alex Ekwueme Federal University Teaching Hospital, Abakaliki. NB: values of AEFUTHA and SEER are expressed in percentage.



**Figure 1.** Comparative evaluation of site of involvement at various National Centers. AEFUTHA = Alex Ekwueme Federal University Teaching Hospital Abakaliki. SEER = Surveillance Epidemiology and End Result.

cancer; 80% of new cases occur in developing countries [24]. Cervical cancer being the commonest gynaecological cancer in this study is consistent with what was reported in Northern and Eastern parts of Nigeria, India and south Asia [3] [4] [21] [23]. The proportion of cervical cancer (49.2%), in this study, is however, low when compared with 74.9% reported in Jos and 78% reported by Ugwu *et al.* in Enugu but slightly higher than 48.6% reported in Kano [3] [4] [7] [21]. Improved efforts at cervical screening and early detection of cervical dysplasia in the last 10 - 15 years in centres in developed countries have led to this reduction in the proportion of gynaecological malignancies from cervical cancer.

The position of ovarian cancer as the second commonest gynaecological cancer in this study is similar to what has been reported from Agarwal *et al.* in India [2], Sanni *et al.* in Jos [4] and in Kano by Yakasai *et al.* [21], but with a higher proportion of 27.8% compared to the other series [26]. The higher proportion of ovarian cancer in our study compared to other study is probably due to awareness of various gynaecological conditions created by Ministry of Health of Ebonyi state through various radio and television broadcasts, which makes women with such condition present at our centre. Besides, other peripheral hospitals have also improved in their referral systems, whereby cancers are now being referred to our centre for specialist care. However, in a study by Jamal *et al.* in Pakistan, ovarian tumors were the most frequent, comprising 42.4% of all gynaecological malignancies and cervical cancer, which is the most frequent in most studies in developing countries, was the second most frequent gynaecological malignancy in Pakistan [27].

Uterine malignancies are the third commonest gynaecological malignancy in this study and this was in keeping with what was recorded in other parts of the country and developing countries in India and South Asia [4] [21]. However, Surveillance, Epidemiology and End Result (SEER) in United State and studies

done in European Union reported significantly higher proportion [24] [25]. Vulva and vagina cancers had lowest incidence in this study and this is the same across international centres. The peak age of incidence of cervical cancer was seen among 55 - 64 years age groups and this is similar to the earlier report that cervical cancer has bimodal age distribution *i.e.* commoner among 35 - 39 years and 60 - 64 years age groups [24]. There is also increase in incidence of cervical cancer with increasing parity which is in keeping with earlier reports [3] [4] [21] [22] [23] [24]. The relationship between increasing parity and development of ovarian, uterine, vulva and vagina cancers in this study are not statistically significant and this is similar to the earlier reports [24]. One of the important risk factors for development of malignancies is usage of tobacco. However, none of our patient gave a history of tobacco consumption. This may be due to cultural aversion to usage of tobacco in southeastern part of the country. As a result, association between tobacco usage and development of gynaecological malignancies could not be ascertained.

The median age of occurrence of cervical, vulva and vagina cancers in this study were almost the same as was observed in SEER study. However, the median age of occurrence of ovarian and uterine cancers was lower compared to SEER study [24]. A comparative analysis of proportionate site of involvement and median age was also reported. The percentage incidence of gynaecological malignancies reported in our centre according to site and age group affected is presented and compared with the international data. A comparative evaluation of data with the SEER programme revealed significantly lesser percentage of cervical malignancies among our patients in 20 - 34 years age group, whereas a higher percentage was noted in 45 - 64 years age group. This may be a manifestation of better screening programme in the United State where cervical malignancies are detected in younger age group at early stage when compared with developing countries.

Among patients with uterine malignancies in this study, significant higher incidence was noted in 45 to 64 years age group. A similar trend was noticed in a report from Asian registry where uterine cancers occur a decade earlier than in the West [25]. On the contrary, relatively higher percentage of ovarian malignancies in children and young adult (from birth to 44 year) was noticed and such was similar to the findings in India [2]. The frequency of gynaecological malignancies among patients older than 75 years was low as only one case, each of cervical cancer and vulva cancer was seen in this age group and this is similar to what was reported by Agarwal *et al.* in India [2]. This is probably due to lower life expectancy in developing countries like Nigeria. There was no significant difference in the distribution of vaginal and vulva cancer in this study when compared with the international data [2] [24].

The extent of spread of primary malignancies in our centre was compared with data available from SEER registry [24]. Significantly higher percentage of cervical cancer presented with regional spread at our centre (67.7%), as compared with localized disease in SEER registry cases (35.2%). This suggested dis-

parity in the effectiveness of screening programs. The distributions of uterine malignancy in both cohorts of patients are similar [24]. There is paucity of data on the stage of presentation and histological subtype of ovarian malignancies in African region. However, majority of ovarian cancer (68.6%) in this study presented at advanced stage and this was similar to what was reported by SEER in which 60% of cases presented with advanced diseases, 19% regional and 15% with localized diseases [24], but contrary to the report of Agarwal *et al.* in India in which 57.14% of patients presented with localized diseases, 30.1% with regional spread and 6.63% with advanced diseases [27]. Whether this implies environmental or genetic differences in tumour profile remains to be ascertained.

This study has some limitations. Firstly, this is a hospital-based study which included only women that reach hospital but many women die of gynaecological cancers in rural areas without reaching health facility due to poverty. Community-based studies are a better tool for exploring cancer rates in developing countries. Secondly, a considerable number of women with gynaecological cancers in our centre had no histological diagnosis and were not included in this study. This probably accounted for a lower incidence of cancer types when compared to international centres.

## 5. Conclusion

This study represents a recent update on profile of gynaecological malignancies in our hospital. However due to lack of widespread population-based data, hospital-based registries form the main source of data in this country. Cervical carcinoma was the commonest gynaecological cancer in Abakaliki and majority of cases of gynaecological malignancies presented at advanced stage with its accompany treatment dilemma. There is need for a comprehensive oncology unit equipped with standardized facilities and personnel as advanced cases in this study had to be referred due to non-availability of radiotherapy equipment in our hospital. Also, there is a need for appropriate cancer registry which will enhance our policy formation and health planning.

## Conflicts of Interest

The authors declare no conflict of interest.

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# Functional Contentment Model: Optimizing Quality of Life for Nursing Home Residents with Dementia

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## Abstract

The Functional Contentment Model (FCM) attains two objectives: 1) building a relationship focused plan of care for nursing home residents diagnosed with dementia; and 2) maximizing and maintaining older adults' contentment, peace, and happiness while living in dementia care environments. There are three essential components within the FCM: 1) Person/Family Centered Care; 2) Slow Medicine; and 3) Team Care Management. The principles of "Person/Family-Centered Care" are coupled with the philosophy of "Slow Medicine," and neither can exist without the engagement of "Team Care Management." In short, the FCM maximizes the older adult's potential functioning in activities of daily living, cognition, gross and fine motor skills, communication, and physical well-being, while maintaining the highest possible level of contentment, peace, and happiness. This is accomplished through dynamically utilized professional modalities adapted to the changing needs of the older adult resident—pharmacologic, physical and occupational therapies, family education and involvement, dietary, spiritual, stimulating activities, as well as any individualized modality. The lead for operationalizing the Functional Contentment Model is the nursing home medical director, whose key role is assuring a team approach to care including the older adult resident, the family, and all staff (dietary, housekeeping maintenance as well as care and administrative staff). The FCM is a culture change model that has implications in practice and policy for each nursing home.

## Keywords

Dementia Care, Functional Contentment, Nursing Home, Person-Centered Care

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## 1. Introduction

Residents with dementia often pose a challenge to providing person-centered care for long-term care residential environment administrators, staff, and medical directors. Historically, we have not done well in meeting this challenge, as evidenced by less than optimal resident quality of life, family satisfaction, and staff satisfaction and retention [1] [2] [3]. By utilizing a creative approach to person-centered care, built on new models of medical practice and team care, we can improve the quality of life for nursing home residents with dementia, their family care partners, and the staff. This article introduces the Functional Contentment Model (FCM) developed at the University of New England College of Osteopathic Medicine Mature Care Practice in Maine, USA. MatureCare provides medical directorship and patient care to residents and skilled rehabilitation patients in 15 nursing homes. The primary goal of the Functional Contentment Model of care is functional contentment of the resident with dementia; exhibited through actions that convey a sense of purpose, calm, and feeling at peace. Secondary outcomes include increased satisfaction of family members, direct and indirect care staff, and nursing home professional staff and practitioners.

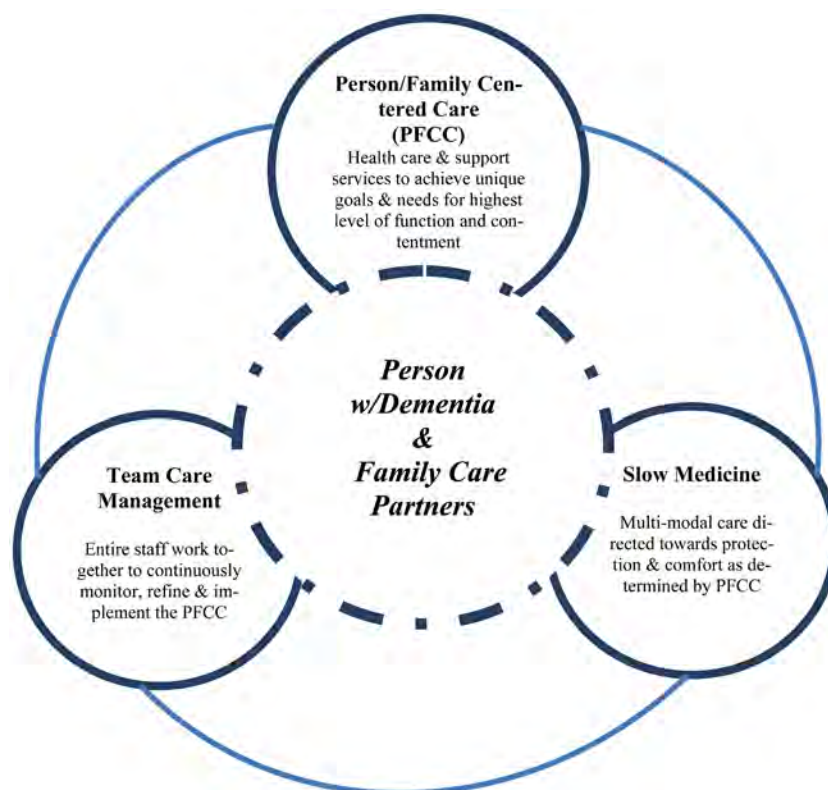
Of the total U.S. population, one in ten people (10 percent) age 65 and older has Alzheimer's dementia or related dementias [4] [5]—a predictor of eventual need for long-term care supports and services. As of 2012, more than 5 million Americans had the disease. By 2050, the prediction is this number will grow to 16 million. The percentage of people with dementia increases with age; 3 percent of people age 65 - 74, 17 percent of people age 75 - 84, and 32 percent of people age 85 and older have Alzheimer's or related dementia [5]. There is a direct link between disease and the need for nursing home care. Admission by age 80 is expected for 75% of people with dementia compared with only 4 percent of the general population. [6]. Overall, 50% of nursing home residents have Alzheimer's or related dementia [7]. In Maine, the oldest state (44.5 average age) in the union, the number of persons living with dementia is estimated to increase from 37,000 individuals in 2012 to over 53,000 individuals by 2020 [8]. In 2012, 58% of Maine nursing home residents had dementia and nearly half (44%) of the people receiving community and facility-based long-term services and supports (LTSS) had dementia [7]. It is essential with the rise in nursing home residential care for people with dementia that we instill sound models of care in their environments. Proper care will benefit the older adult, his/her family and nursing home staff/practitioners.

## 2. Functional Contentment Model Methods

### 2.1. Three Essential Components

Within the Functional Contentment Model (FCM), one must consider three essential components: 1) Person/Family Centered Care; 2) Slow Medicine; and 3) Team Care Management (see **Figure 1**: Functional Contentment Model). The principles of "Person/Family-Centered Care" are coupled with the philosophy of





**Figure 1.** Functional contentment model.

“Slow Medicine,” and neither can exist without the engagement of “Team Care Management.” In the FCM, “functional” is defined as: of or having a special activity, purpose, or task; designed to be practical and useful, rather than attractive [9]. “Contentment” is defined as: a state of happiness and satisfaction [9] [10].

1) Person/Family Centered Care (PFCC): Person/Family Centered Care generally refers to an orientation to the delivery of health care and supportive services that considers the older adult’s needs, goals, preferences, cultural traditions, family situation, and values [11]. The resident is the key member of the team with the family at the center as well. Continuous monitoring of the resident’s experience of care (feelings or expressions about the care) as well as the family’s experience is essential to a congruent care plan for the resident. Within person/family centered care, the care team includes the health professionals, social service professionals, direct care staff, and support staff such as housekeeping, food service, and maintenance. Services and supports are delivered from the perspective of the resident [11]. For nursing home residents with cognitive impairment, the family care partner(s) engagement is integral to achieving person/family centered care. This concept holds true even if the family is not the biologic family but a health care power of attorney (POA) or support person of choice by the resident. Family/POA involvement in the planning process helps the care team know the resident’s personhood, personal needs, wants, capacity, and expression of autonomy; all factors important for creating a successful care plan. Family care partners may recognize changes that indicate a decrease in

resident function and/or contentment; both signs that can guide changes in the care plan to attain functional contentment.

To be clear, the FCM does not advocate for formal care management team meetings in which the resident is at the table as a participant. Instead, two options are possible depending on the level of cognitive impairment: First, for residents with early to moderate cognitive impairment, they possess the capacity to express daily preferences for care and should be encouraged to discuss their everyday care wishes with their family and the care team in a natural setting. Second, for residents at the later stages of cognitive impairment, the resident may communicate his/her autonomy through behavior, which the family and care team must learn to translate to specific care plans. Understanding these expressions and behavioral cues for residents in the mid or later stages of dementia, along with familial/care partner input, is the first important step to achieving Person/Family Centered Care as part of the Functional Contentment Model.

2) Slow Medicine: Slow Medicine for care of older adults, a concept published by Dr. Dennis McCullough, geriatrician, is directed towards the protection and comfort of the older person rather than cure of an ailment [12]. According to McCullough, “Slow Medicine embraces the unsung work of daily attention that is the greatest need and firmest foundation for longevity and quality of life at the farthest reach of age” ([12], p.xxi). It focuses attention on older persons and their specific challenges and needs; including family wishes to ensure congruent care regardless of the medical setting. Slow Medicine is an intentional plan for a) understanding the older adult’s physical/cognitive/emotional needs, medical diagnoses, values, life, choices, and living circumstances; b) caring about the older person and his/her family; and c) living well as determined by the older adult, the family and the provider. Based on the belief that the best decisions about care come from a measured approach; collecting information and moving forward slowly while continually reassessing is key [12]. The philosophy and practice of Slow Medicine serves older adults well because their journey of late life is more complicated than that of middle age. Factors like the older person’s stage in life, strength, and the severity of the ailment play a vital role in the practice of Slow Medicine. Dr. McCullough stated that a successful outcome in the care of an older person was based on the repeated assessment of the choices of the older person and his/her family [12]. To enrich an older person’s life to the end, Dr. McCullough identified five fundamental principles to guide families, health professionals, caregivers, and other care team people:

- a) Understand older persons deeply—their complexity, acknowledging losses and newly revealed strengths that come with aging.
- b) Accept the need for interdependence while promoting mutual trust.
- c) Learn to communicate well and with patience.
- d) Make a covenant for steadfast advocacy—the doctor becomes the dedicated “agent” for the older adult and the family; although unwritten and often unspoken, she/he will be there in the time of need.
- e) Maintain an attitude of kindness no matter what—days of caregiving

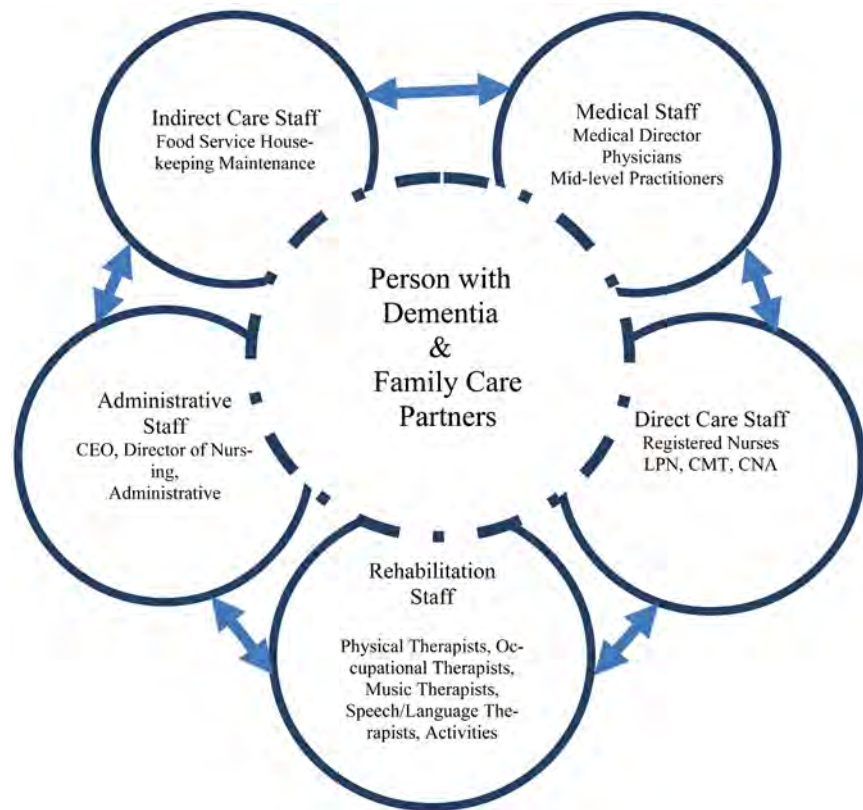
are often long and difficult requiring patience and forbearance when there appears to be a seemingly endless cycle of chores ([12], Excerpt pp. 3-12). With these five principles in mind, the family, the medical director, and the nursing home staff have a responsibility to each other and the older person to provide mindful care.

3) Team Care Management: A well designed and managed care team for each resident with dementia is an essential component of the Functional Contentment Model. Staff stability is important to the resident's development of trust, comfort, and sense of safety. Staff's depth of understanding of the person they care for or encounter during their duties provides opportunities for consistent interactions with residents. The staff's ability to recognize and report subtle changes in a resident's health, comfort, actions, and function should be standard practice for each staff member. Honoring the insights and input of maintenance, housekeeping and dietary staff as much as the health and service providers are central to recognizing and responding to the resident's care needs.

The Team Care Management approach is described as: "a work group that is made up of individuals who see themselves and who are seen by others, as a social entity who are interdependent because of the task they perform as members of a group, and who perform tasks that affect others" ([13], p.308). Studies in a variety of work environments have shown that there are several potential benefits associated with team organizing, including greater job satisfaction, greater commitment, and greater effectiveness and quality [13]. However, the nursing home setting is unique as is the care for residents with dementia. In three studies conducted by Havig *et al.* [14] [15] [16] on team care management and workgroups, all three studies revealed that active leadership, represented by task- and relationship-oriented leadership styles, and the use of teams or workgroups, are related to higher quality of care in nursing homes [14] [15] [16]. In the last study Havig *et al.* [16] conducted, they found that functional teams/work groups were found to be effective when each member: 1) assumes ownership, 2) perceives an insider status, and 3) shares mental models. Active leadership is dependent on work ethic, work environment, professionalism, and organizational vision [16]. In essence, the studies have noted that enhanced success for workgroups and active leadership in a variety of long-term care settings each included engagement, feeling a sense of contribution, camaraderie, being included in care processes, exhibiting a good work ethic, and upholding the nursing home philosophy of professionalism [16]. Teamwork has an especially important meaning in a successful older adult care partner process. Including residents and their representatives into the decision-making process creates better information flow and consultation procedures to achieve a true dialogue both within the team and with the residents and family (see **Figure 2: Functional Contentment Team Care Management Model**) [17].

## 2.2. Operationalizing the Functional Contentment Model

In short, the Functional Contentment Model (FCM) is a relationship building



**Figure 2.** Functional contentment team care management model.

plan of care with the goal of maximizing the older adult's potential functioning in activities of daily living, cognition, gross and fine motor skills, communication, and physical well-being, while maintaining the highest possible level of contentment, peace, and happiness. This is accomplished through dynamically utilized professional modalities adapted to the changing needs of the older adult—pharmacologic, physical and occupational therapies, manipulative therapy, family education and involvement, dietary, spiritual, stimulating activities (memory), as well as any individualized modality. The lead for operationalizing the FCM is the nursing home medical director, whose key role is assuring a team approach to care. Every staff member in the nursing home (including maintenance, cleaning, and dietary/food service staff) as well as family and friends and of course the resident makes up the team approach to care.

### 2.3. Clinical Assessment Elements of the Functional Contentment Model

There are seven clinical assessment elements that are paramount to the Functional Contentment Model (see **Table 1:** Checklist for the Functional Contentment Model Assessments). The continuous reflection on and across these seven clinical assessments with each older adult is fundamental to recognizing his/her autonomy that contributes to functional contentment.

Below, each clinical assessment element is listed and defined based on the

**Table 1.** Checklist for the functional contentment model assessments.

Check	7 FCM Components	Who Assesses and/or Supports
✓	Life History	Resident, Health and Service Staff, Family and All Staff
✓	Comorbidities	Health Providers and Care Staff
✓	Medication Evaluation—Benefit/Risk	Pharmacy/Health Providers
✓	Physical Abilities	Physical, Occupational, and Speech/Language Therapists
✓	Cognitive Abilities	Resident, Family, Health Providers w/ Support of All Staff
✓	Support System	Resident, Family, Social Services and All Others
✓	“Living a Full Life to the Very End” Plan/End of Life Plan	Resident, Family, Social Services, Chaplain, Health Providers

#### Functional Contentment Model:

**Life History:** The life history is foundational and all staff need to be facile with what questions to ask to ascertain a conversational life history. The more staff know and share about the resident, the more able they are to meet the person’s functional needs and maximize his/her contentment.

**Co-Morbidities:** The diagnosis of dementia is one among other medical diagnoses for the nursing home resident; awareness of all diagnoses and associated treatments (pharmacologic/non pharmacologic) are to be weighed relative to the other six clinical assessment elements, adjusting the FCM care plan accordingly.

**Physical Abilities:** The resident’s physical function and ensuring optimization of desired function contribute towards a sense of peace, happiness, and wellbeing.

**Cognitive Abilities:** The level of dementia and its progression is baseline information. The plan associated with cognitive abilities needs to be adapted continually as the resident transitions. The care management team requires guidance by the medical director regarding what to look for and how to document observations on individual residents.

**Support System:** The resident with dementia can be supported in a variety of ways; including but not limited to, family, friends, nursing home staff, or a stuffed or real pet (depending on the home). Each person who is part of the overall support system plays a role in maximizing the older adult’s function and contentment.

**Medication Evaluation—Benefit/Risk:** The resident’s medications require periodic reviews; determining how each contributes to optimizing or compromising functional contentment and modifying medication regimens is essential to resident function and contentment.

**Living a Full Life to the Very End/End of Life Plan:** The individual’s life plan may be firm or emerge through time in the care setting. However, the earlier the resident’s end of life plan is accepted for living a full life to the very end [18]; the more congruent the Functional Contentment Model roadmap of care supports

the philosophy of the resident until his/her final breath.

There is no set order for implementation of each FCM element. The Functional Contentment Model requires that each of the seven clinical assessment elements is reviewed and adapted when any member of the care management team observe changes in the resident. Success can be determined by assessing the need for fewer or no mood stabilizers; fewer or no behavioral outbursts; improved appetite; improved sleeping patterns; participation in activities if able; allowing staff to provide personal care.

### **3. Functional Contentment Case Study**

The following case, a patient of the first author, illustrates how the Functional Contentment Model optimized care for Mrs. Joan Doe. Upon admission, the following was determined for Mrs. Doe. The FCM implementation is then presented further below (Section 4).

#### **Patient Description**

Joan Doe is an 81-year-old (at admission) female and married. Her height is 5'3" and she weighs 127 lbs. She was born and raised in Maine and educated in Massachusetts. She received a Bachelor's degree in Education and a Master's Degree in Special Education. She married Ernest in 1959 at age 24 and had 2 children, Dan and Sarah. They moved to Maine in 1969. Ernest owned a motor repair company while Joan taught Special Education and eventually served as Special Education Director for many years at a local high school. Her hobbies included gardening and baking. She always prided herself on being well dressed and "proper" in her behavior. She admitted to long-standing social anxiety and being most comfortable with family and friends. In her early 70's, Joan became increasingly reclusive, anxious and forgetful. As her memory declined and her anxiety increased, it became more and more difficult for Joan to have her needs met at home.

##### **1) Case History**

Mrs. Doe's pre-existing condition was progressive dementia over the past seven years. She is unable to care for herself independently due to cognitive decline, has urinary and bowel incontinence, and impaired communication secondary to altered mental status. At the age of 78, she was first admitted to a nursing home; but after 3 years that nursing home was unable to meet her needs as her dementia increased and her self-attentiveness decreased. She moved to the memory care environment at the current nursing home, which is located 35 miles from her home where her husband resides.

##### **2) Diagnoses**

Cognitive Impairment; Hypertension; Hyperlipidemia, Hypothyroidism; Urinary/Bowel Incontinence, and Osteoarthritis.

##### **3) Medications**

a) Lipitor 20 mg po q day; b) Lisinopril 10 mg po q day; c) Risperdal 1 mg po bid; d) Ativan 0.5 mg po q 6 hours prn; e) Ambien 5 mg po q hs prn; f) Meto-



propranolol 50 mg po bid; g) Synthroid 125 mcg po q day; h) Namenda 10 mg po bid; i) Aricept 10 mg po q day; j) Senna s 1 po bid; k) Vitamin D 1000 IU po q day; l) Tylenol 650 mg po q 6 hours; m) Multi vitamin q day.

#### **4) Daily Function**

Mrs. Doe ambulates short distances with walker and one assist, but primarily is wheel chair reliant. She is essentially aphasic with occasional yelling out. She is unable to transfer without 1 - 2 assist. Mrs. Doe is toiletied regularly; she is incontinent of both urine and feces. The MOCA (Montreal Cognitive Assessment) score was 5 out of a possible 30. Mrs. Doe was unable to perform the PHQ 9. She shows intermittent recognition of husband (who is there daily for at least 10 hours/day), but rarely recognizes children (who are involved in care planning but visit usually once a week). She is resistant to care. Unable to perform any Activities of Daily Living (ADLs) including feeding herself.

#### **5) End of Life Plan**

Full Code without POLST (Physician Orders for Life Sustaining Treatment); husband is health care power of attorney.

### **4. Implementation of the Functional Contentment Model for Mrs. Doe**

Based on the information provided in Mrs. Doe's case study, the first step is to review the seven clinical assessment elements of the Functional Contentment Model (see **Table 2** for details) and adapt or adjust each according to the three components of the FCM; Person/Family Center Care, Slow Medicine, and Care Team Management.

### **5. Case Results**

Mrs. Doe was a relatively uncomplicated nursing home resident except for early bouts of yelling and her resistance to assistance with her Activities of Daily Living by staff. Her dementia was severe and yet the adverse behaviors reduced as she responded well to the team effort to maximize her function and contentment. A set staff team was assigned to Mrs. Doe to maintain continuity of care through day and evening shifts; midweek and weekends. Through application of the Functional Contentment Model she became more engaged with staff and family and was more pleasant when assisted with Activities of Daily Living, such as bathing, grooming, and eating. Mrs. Doe appeared more relaxed, especially with her robotic puppy, and participated, or at least tolerated a variety of activities. Her husband, with time, felt less compelled to be at her side 10 hours a day, and began to come later and leave earlier; he even resumed his twice-weekly golf game, which he had abandoned for several years. Morale was positive for the staff including the service staff who knew that Mrs. Doe preferred their company.

Mrs. Doe died peacefully 26 months after the implementation of the FCM in the Memory Care environment. Her husband and children felt that she had finished her life with contentment, which brought them a sense of peace.

**Table 2.** Seven clinical assessments of Mrs. Doe's functional contentment.

Seven Clinical Assessments of Functional Contentment	Functional Contentment Team Management Plan Considerations
Life History/Preferences	The life history provides the foundation for Mrs. Doe's life. Let the life history morph into a dynamic life story that creates a bridge to the present. Create a list and post it by her door (include Mrs. Doe if feasible) that includes key points about who she was, what she prefers now, what her desires are (foods, spirituality, music, etc), and what her special needs are (glasses, assistive devices, etc).
Co-Morbidities	Mrs. Doe's medical history is without catastrophic events and illnesses. Her physical exam confirmed that she was a relatively healthy 81 years old. The FCM focus is her cognitive impairment, incontinence, hypothyroidism, and osteoarthritis.
Medication Evaluation	Mr. Doe (husband) agreed that essential medication should include only those that would provide her comfort (contentment). Synthroid continued for hypothyroidism to avoid the discomfort of a hypothyroid state. Lipitor, Lisinopril, Metoprolol, Vitamin D, and the Multivitamin were titrated where necessary and discontinued. Ambien was titrated and discontinued without difference in sleep patterns. Aricept and Namenda were discontinued to allow Mrs. Doe to be in a natural state. Tylenol and Senna-s are now given in the evening. After two weeks of "settling in" the Ativan was discontinued for non-use once non-pharmacologic interventions were in place, such as iPod music therapy and robotic pet (puppy) companionship. Metoprolol and Risperdal were titrated and discontinued and Mrs. Doe exhibited an increase in energy. Adhering to the Slow Medicine philosophy, nine of the previous 13 medications were discontinued over a two-week period; appearing to not adversely affect Mrs. Doe or her behaviors.
Physical Abilities	Physical Therapy, Occupational Therapy, and Speech/Language Therapy evaluated Mrs. Doe's physical abilities and each professional staff developed goals and a plan for her during her stay that matched the proposed goals for the Person/Family Centered Care plan.
Cognitive Abilities	Despite the low score on the MOCA, the increase in energy from decreasing certain medications and the implementation of the non-pharmacologic interventions, Mrs. Doe's contentment continued as did her recognition of her husband. Her "yelling out" ceased with the increase in contentment.
Support System	FCM care management team developed a picture of Mrs. Doe's previous support system and what parts of that system remained or needed to be added. It was determined that Mrs. Doe had a favorite housekeeper and food service worker. Efforts were made to ensure these staff members had time with Mrs. Doe. The robotic puppy calmed her and members of the Care Team, including her children, learned skills to support Mrs. Doe during their time together.
Living a Full Life to the Very End/End of Life Plan	Mr. Doe continued as Health Care POA. The medical director had educational conversations with Mr. Doe and introduced the POLST form. Mr. Doe shared the information with his children and within two weeks he had decided to complete a POLST form which indicated comfort care, while maintaining only medications that were essential for comfort.



## 6. Discussion

The Functional Contentment Model is a multidimensional care model. Those of us in nursing home care know that each resident is multifaceted with distinct personalities and individual needs. The traditional medical, social, and physical examination and review of recent and past medical interventions is fundamental to good medical care, but insufficient when considering the contentment of the resident with dementia and his/her family. The Functional Contentment Model approach to care requires that staff in every capacity have an appreciation of the resident's personhood and how that person defines quality of life—the meaningful life experiences, preferences, social supports, etc.—as may be evidenced by photos and other personal artifacts, family information, inter-personal communications, desires, and behavior. Through continuous accumulation of the resident's life story focused on Person/Family Centered Care, adjustments to services/approaches to meet the needs and wants of the resident will be more effective, even as cognitive function changes. Slow Medicine simplifies interventions, reducing/discontinuing those medications that are not contributing to resident well-being or improving function, while supporting communication, patience, and full care. Team Care Management, in the broadest sense of team, provides opportunities for all staff along with the resident and the family to have a role in establishing resident function and contentment.

## 7. Clinical Implications

- The goal is to find ways to create joy and well-being with each resident with dementia.
- The biggest challenge for successfully maximizing a resident's function and contentment is the dementia and its progression; therefore, challenges for FCM successful implementation is “buy in” from the family and nursing home staff—it takes a team to make this work and the more involvement by all connected with the resident the better.
- The implementation of the three components and seven FCM clinical assessment elements provides a fresh approach to resident care and well-being; focusing on the resident and family goals.
- Reframing the traditional medical model of identifying the resident “problem list” to focus on the resident's capacity, desires, and well-being within the FCM seven elements builds a quality of life network for that resident that also aids staff satisfaction.
- The Functional Contentment Model is a culture change model that has implications in practice and policy for each nursing home.
- Research on the FCM is warranted; the suggestion is to conduct qualitative case study research on individual residents and as more cases are documented, to then include pre/post survey and focus group interviews with nursing home staff and families.
- This iterative process for creating culture change is manageable, affordable,

person-centered, and progressive.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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# Trampoline Troubles: Serious Traumatic Injuries in Children from a Trampoline Park, a Case Series

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## Abstract

**Background:** Trampoline use is one of the most common causes of recreational injury in children. In recent years, trampoline parks have grown in popularity and may be altering the spectrum of the trampoline-related injuries that occur. These parks create increased opportunity for injuries that appear uniquely different from accident patterns seen with home trampoline use. Recent work has suggested this may result in injuries occurring in greater frequency and with increased severity that may result in a greater need of hospital admission and procedural management by subspecialty services. **Case Series Presentation:** This case series presents three such examples occurring after the opening of a trampoline park in our local community: 1) A displaced forearm fracture requiring closed reduction and orthopedic follow-up; 2) An ankle fracture necessitating operative reduction and fixation; and 3) A facial injury with tooth avulsion prompting oral surgery consultation and endodontic follow-up. **Conclusions:** These cases demonstrate the complexity and severity of injury that can occur from trampoline park participation and should serve to increase awareness among health care providers of these risks to provide appropriate parental counseling and advocate for preventative measures.

## Keywords

Trampoline, Injury, Pediatrics, Trampoline Parks, Trauma, Children

## 1. Background

Trampolines have long been a staple of childhood enjoyment and recreational

play. However, the rising incidence of Trampoline-Related Injuries (TRIs) cannot be overlooked, accounting for over 100,000 emergency department visits in the United States annually and representing a significant portion of pediatric accidental injuries [1] [2] [3]. In the past, trampolining took place predominantly in the home with injuries occurring most often from improper landings onto or falling off the trampoline. Recently, however, we have seen a growth in the popularity of trampoline parks, changing the environment in which trampolining occurs. Instead of a single jumping surface, as seen with home trampoline use, by design, these parks place numerous jumpers and trampolines together in close proximity providing increased opportunities for collisions and falls. As one may anticipate, recent literature suggests these parks are contributing both to the rising frequency and severity of TRIs [4] [5] [6]. Unlike water parks and amusement parks, most trampoline parks are not currently regulated by a national standard. Recently, members of the International Association of Trampoline Parks attempted to develop international safety standard guidelines, however, the standards are voluntary and parks are not required to follow or adhere to the guidelines. There are not current standard regulations limiting the number, sizes or ages of jumpers or the design and placement of trampolines and other activities used in many popular trampoline parks in the United States or other countries. Most parks require participants or their parents to sign risk warnings and a waiver of liability. Currently, Arizona is the only state in the United States that has passed legislation in an attempt to regulate trampoline park safety.

Injuries sustained while trampolining most commonly occur in children and adolescents [1] [4]. Although a variety of mechanisms have been described, TRIs are most frequently due to incorrect landings or falls while on the trampoline. Other common mechanisms include falls from the trampoline mat, collisions with other jumpers, and impact from the trampoline springs or frame [4] [7] [8]. Multiple simultaneous jumpers, attempted acrobatic stunts and participants who are of varying weight and height jumping at the same time on the trampoline are the most cited risk factors for injury [4] [7] [9] [10]. As a result, younger and smaller children are at the greater risk of injury. Fractures, soft tissue injuries, dislocations, and lacerations are most commonly sustained, however, more serious and potentially fatal spine and skull injuries have been reported [4] [11] [12]. Due to this level of severity, many TRIs may require urgent and emergent medical attention.

In January of 2016, a trampoline park opened in our local community of Gainesville, Florida. Since this time, pediatric emergency medicine providers at area hospitals have noted that TRIs appear to be occurring with greater frequency and presenting with diagnoses carrying greater morbidity. In this report, we present three cases demonstrating the variety of injuries that have been cared for since the park opened. Each is unique in mechanism, pattern and treatment required, providing a good representation of the breadth and complexity of injuries that can occur with trampoline park use.

## 2. Case Series Presentation

**Case 1:** A 12-year-old female with no past medical history presented to the pediatric emergency department with an arm injury occurring immediately prior to arrival at a local trampoline park. She had been jumping on a trampoline when she attempted to do a flip and landed on her left arm while outstretched. On arrival, the patient was noted to have a noticeable forearm deformity with a neurovascularly intact limb. She was provided with adequate pain and nausea control. Radiographs demonstrated a middle-third fracture of both the radius and ulna with 32 degrees of apex volar angulation (**Figure 1(a)**). Based on her age and the degree of angulation, the patient required conscious sedation with ketamine in the emergency department for reduction and long arm casting by the orthopedic service. Her angular deformity was reduced to 11 degrees and left without rotational malalignment (**Figure 1(b)**). The procedure was uncomplicated and her neurovascular status remained unchanged. The patient was discharged with follow-up in the orthopedic clinic. After 6 weeks of immobilization, she went on to fracture union with mild—but acceptable—residual angular deformity (**Figure 1(c)**). At her 8-week follow up visit with the orthopedic surgeon, she demonstrated no loss of elbow motion with a 20-degree reduction in pronosupination. She was ultimately released to full activities.

**Case 2:** A 14-year-old female with no past medical history presented to the pediatric emergency department two hours after injuring her ankle at a local trampoline park. She reported the injury occurred after an awkward landing on her left ankle, twisting it in an unknown fashion. She described pain that progressively worsened and was unable to bear weight. The limb demonstrated substantial soft tissue swelling and tenderness diffusely but was without significant limb deformity and was neurovascularly intact. The patient received pain control in the emergency department and underwent radiographs of the left ankle which identified a Salter-Harris IV fracture to the distal left tibia and a Salter-Harris II fracture to the distal left fibula on radiographic imaging (**Figure 2(a)**). Further imaging with a computed tomography (CT) scan identified a comminuted, minimally displaced fracture of the medial malleolus with extension into the posterior malleolus as well as a minimally displaced transverse fracture of the lateral malleolus. Based on these findings, operative intervention was warranted for restoration of the articular surface. The patient was initially splinted and sent for orthopedic outpatient follow-up for surgery. With near complete closure of her physis noted, the patient was managed with open reduction and internal fixation of the medial malleolus with two cannulated screws (**Figure 2(b)**). At her 12-week follow up with the orthopedic surgeon, the patient demonstrated stable alignment without hardware complication (**Figure 2(c)**). She has initiated full weight bearing on the ankle.

**Case 3:** A 17-year-old male with no past medical history presented to a free-standing emergency department with a facial injury that occurred just prior to arrival. The patient had been jumping at the local trampoline park when he



(a)



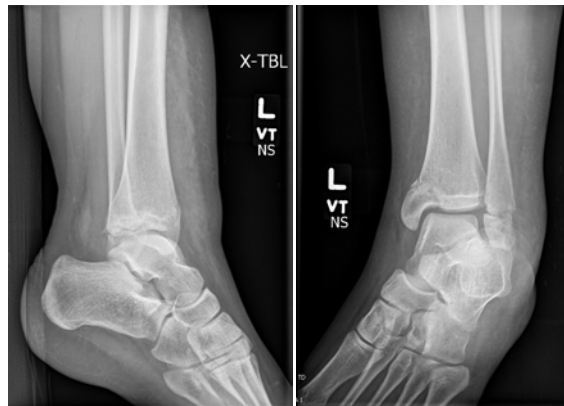
(b)



(c)

**Figure 1.** (a) AP and Lateral radiographs of a both bone forearm fracture with apex volar angular deformity. (b) AP and Lateral radiographs of the forearm status post reduction and casting demonstrating improved angular deformity. (c) AP and Lateral radiographs of the forearm with interval bridging callous and maintained alignment after cast removal.





(a)



(b)



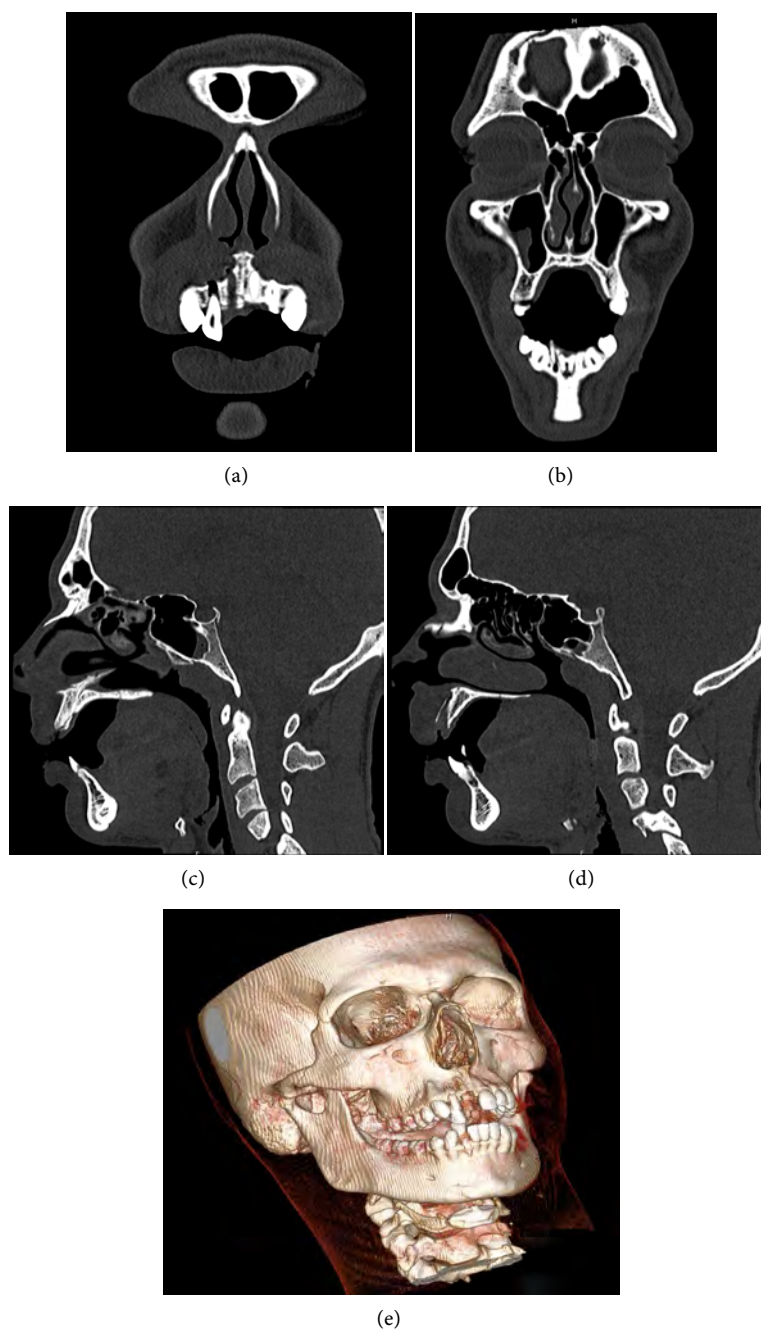
(c)

**Figure 2.** (a) Lateral and Mortise radiographs of the ankle in a patient nearing skeletal maturity demonstrating a minimally displaced trimalleolar ankle fracture. (b) Lateral and AP radiographs after open reduction and internal fixation of the medial malleolus. (c) Lateral and Mortise radiographs of the ankle after removal of immobilization showing fracture union with intact hardware.

landed in an uncontrolled fashion, driving his knees into his face. He was noted to have bleeding from his mouth along with oral and maxillary pain. Workup at



the emergency department showed subluxation of tooth #7 and #26 with avulsion of tooth #8, as well as a laceration to the upper gingival tissue and both lips. The patient then underwent a CT scan showing minimally displaced fractures through the alveolar ridge of the maxilla and mandible as well as a non-displaced fracture through the left maxillary buccal cortex adjacent to the root apex of tooth #8 (**Figure 3**). Tooth #8 was re-implanted by the emergency physician.



**Figure 3.** Selected coronal (a) and (b), sagittal (c) and (d) and three-dimensional reconstruction (e) of a maxillofacial CT scan demonstrating traumatic extraction of the right upper central incisor and subluxation of the upper and lower right lateral incisors with an associated fracture through the alveolar ridge of the maxilla and mandible.

The patient was then transferred to a pediatric emergency department for further care. Upon arrival, he underwent oral surgery evaluation with subsequent repair of his lacerations and splinting of the teeth. Upon discharge, the patient was referred to the endodontic department for further outpatient management. 3 weeks after his initial injury he required a root canal on tooth #8, which was done by an endodontic specialist. He continues to require frequent follow visits to the endodontist to monitor the health of his injured teeth.

### 3. Discussion

This case series highlights three unique injuries occurring at a local trampoline park to demonstrate the variety and severity of TRIs that can occur in these spaces. As seen in this case series, the injuries are variable and can be severe with long-lasting effects on the pediatric patient. Our cases highlighted 2 orthopedic injuries, one with long term range of motion deficit noted at the patient's follow up visit with the orthopedic surgeon. One case presented has required extensive dental repair after his injury and his injured teeth are still undergoing active care with an endodontist. As with home trampoline injuries, park TRIs most often result from improper landings or falls while on the trampoline. [4] [7] [8] The chance of injury increases with multiple individuals jumping simultaneously or attempting acrobatic maneuvers [4] [7] [9] [10], both of which are likely more common in a large group setting where risk-taking behavior can be greater. Our first case highlights an example of an attempted acrobatic maneuver resulting in injury. This patient required the utilization of multiple resources in the emergency department visit for radiographic diagnosis and pain control, anesthesia for procedural sedation, and orthopedic consultation for definitive management and follow-up until fracture union. The occurrence of this mechanism of injury may be reduced with improvements in safety measures and supervision of minors at parks.

Prior investigations have demonstrated that TRIs most frequently involve the musculoskeletal system, with 80% of patients requiring emergency department radiographs, and 41% requiring orthopedic procedures with anesthesia [2] [11] [13]. Results from a review of a national database by Loder *et al.* [13] demonstrated that 29% of TRIs sustain fractures, most commonly in the appendicular skeleton. This study also estimated that the cost of an orthopedic TRI presenting to the ED is nearly \$800 while those requiring admission or surgical intervention can cost over \$7000. Therefore, there is a definitive financial effect on both the patient and the healthcare system, adding to the substantial morbidity of trampoline park TRIs. Our second case demonstrates the extent of healthcare utilization that can be necessary following these injuries. This trimalleolar ankle fracture required an emergency department visit for diagnosis and stabilization, outpatient surgery with open reduction and internal fixation requiring general anesthesia as well as ongoing outpatient orthopedic follow-up until fracture union and return to full weight-bearing. A growing number of TRIs resulting in fractures that necessitate surgery could have a tremendous impact on healthcare spending.

Although musculoskeletal injury is most common, a broad spectrum of injuries have been identified following trampoline accidents. These injuries can lead to extensive workups with advanced imaging, specialist consultation for management and follow-up and prolonged recovery periods. Among the non-musculoskeletal injuries lacerations, concussions and traumatic brain injury are most commonly described. [1] [4] [7] Orofacial injuries, however, are infrequently reported. Thus our third case, a facial injury with tooth avulsion and multiple facial fractures, is illustrative of the severity of even the most unique injuries that occur. This patient required an emergency department visit with transfer to higher level of care, a CT scan, an oral surgery consultation for initial management and ongoing endodontic outpatient follow-up for definitive care.

#### **4. Conclusion**

With the rising popularity of trampoline parks, medical providers are expected to see a growing number of TRIs and greater utilization of subspecialty services. Although the literature regarding accidents occurring at trampoline parks is sparse, early findings suggest these facilities may be associated with increased frequency and severity of resulting injuries [4] [5] [6]. The experience of our local frontline providers would support these findings based on observations following the recent opening of a trampoline park in our community. This case series presents three such injuries occurring in pediatric patients, each requiring acute procedural intervention and extended outpatient follow-up. The current American Academy of Pediatrics (AAP) policy statement on trampoline use in children recommends against the recreational use of all trampolines, both in the home and trampoline parks. Additionally, the AAP advises that if parents allow their children to participate in trampolining that precautions must be followed to attempt to reduce injuries. Some of these precautions include restricting trampoline use to a single jumper at one time, use of appropriate padding around the trampoline and not allowing somersaults, flips or other acrobatic maneuvers while jumping [14]. Further study is warranted to discern whether or not the presence of trampoline parks increase the frequency or alter the variety of injuries occurring in a given population. These cases contribute to the growing body of literature that highlights the injuries sustained from trampoline park usage. Currently, no industry standard regulations exist for trampoline parks. As we add to our collective knowledge of such injuries, healthcare providers can advocate for standardized safety measures as well as contribute to public education and injury prevention awareness. Ultimately, these efforts will aid in advocating for measures to prevent the occurrence and reduce the severity of trampoline-related injuries among children and adolescents.

#### **Consent for Publications**

Written informed consent was obtained from the patient's guardian for publication of this case series and accompanying images.

## Availability of Data and Materials

Data sharing is not applicable to the article and no datasets were generated or analyzed during the current study.

## Authors' Contributions

TS contributed to the conception and identified cases for presentation. JS, BW and TS contributed to the drafting and revision of the manuscript. All authors read and approved the final manuscript.

## Conflicts of Interest

The authors declare that they have no competing interests regarding the publication of this paper.

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### Abbreviations

TRI—Trampoline Related Injury;

CT—Computed Tomography;

AAP—American Academy of Pediatrics.



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