FLOW RATES OF A NOVEL ENTERAL FEEDING SYSTEM

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BACKGROUND:

A novel enteral feeding system (EFS) has been developed which mechanically delivers enteral nutrition (EN) to the patient via elastomeric technology. The novel EFS has four feeding sets ('giving sets') of varying length – 440, 700, 1000 and 1900mm – which provide a variety of flow rates. As with elastomeric intravenous infusion pumps, the novel EFS's flow rate is affected by factors such as device positioning (height), fill volume and temperature, but above all, flow rate of the novel EFS is affected by formula type. Each EN formula and giving set length combination will therefore provide a unique flow rate.

PURPOSE:

- To characterize flow rates of the novel EFS with a variety of commercial EN formulas.
- To compare these flow rates to adult bolus, intermittent, continuous and cyclic feed administration rates.

METHODS:

Flow rate testing of the novel EFS (Mobility+®) was conducted with 40 commercially available US EN formulas, across 4 brands.

Brand 1: Nestlé®, formulas 1-21, (1) Compleat® Pediatric Peptide 1.5, (2) Compleat® Peptide 1.5, (3) Compleat® Standard 1.4, (4) Diabetisource® AC, (5) Fibersource® HN, (6) Isosource® 1.5, (7) Isosource® HN, (8) Nutren® 1.0, (9) Nutren® 1.0 Jr, (10) Nutren® 1.0 Fiber, (11) Nutren® 1.0 Fiber Jr, (12) Nutren® 1.5, (13) Nutren® 2.0, (14) Peptamen® 1.0, (15) Peptamen® 1.0 Jr, (16) Peptamen® 1.5, (17) Peptamen® 1.5 Vanilla, (18) Peptamen® 1.5 Jr, (19) Peptamen® Intense VHP, (20) Replete® and (21) Replete® Fiber.

Brand 2: Abbott®, formulas 22-31, (22) Glucerna® 1.5, (23) Jevity® 1.0, (24) Jevity® 1.2, (25) Jevity® 1.5, (26) Pediasure® Peptide 1.0, (27) Pediasure® Peptide 1.5, (28) Osmolite® 1.2, (29) Osmolite® 1.5, (30) TwoCal® HN and (31) Vital® 1.5.

Brand 3: Kate Farms®, formulas 32-39, (32) Pediatric Peptide 1.5, (33) Pediatric Peptide 1.5 Vanilla, (34) Peptide 1.5, (35) Peptide 1.5 Vanilla, (36) Pediatric Standard 1.2 Vanilla, (37) Standard 1.0, (38) Standard 1.4 and (39) Standard 1.4 Vanilla.

Brand 4: Nutricia®, (40) Neocate® Splash Unflavoured.

Testing was performed in triplicate, in controlled conditions, using a single batch of each formula. The novel EFS was filled with 500g of formula and positioned at stoma height. Temperature was maintained at 68-75.2°F. Electronic scales were used to measure weight of formula delivered, at regular time intervals. Mean flow rate was then calculated based on the time taken for 90% of 500g of formula to deliver.

RESULTS:

A total of 160 mean flow rate values were obtained via testing 40 formulas across the four novel EFS giving set lengths (see Table 1). Mean flow rates ranged from 22ml/hr to 2801ml/hr, varying substantially by formula used.

Table 1. Mean flow rates of a Novel EFS with 40 formulas across 4 Giving Set lengths

Formula Brand	Formula Number	1900mm Giving Set	1000mm Giving Set	700mm Giving Set	440mm Giving Set
Brand 1	Formula 1	N/A	N/A	41	107
	Formula 2	N/A	22	60	142
	Formula 3	24	88	160	272
	Formula 4	100	263	394	631
	Formula 5	116	275	445	694
	Formula 6	73	160	268	439
	Formula 7	237	501	716	1266
	Formula 8	398	870	1264	1929
	Formula 9	370	876	1456	2011
	Formula 10	196	435	712	1004
	Formula 11	346	750	959	1672
	Formula 12	100	186	319	511
	Formula 13	28	57	91	136
	Formula 14	107	213	360	539
	Formula 15	178	318	518	792
	Formula 16	58	111	179	271
	Formula 17	61	114	186	270
	Formula 18	55	113	182	265
	Formula 19	159	303	475	657
	Formula 20	117	274	430	675
	Formula 21	137	272	431	750
Brand 2	Formula 22	42	78	155	228
	Formula 23	34	77	133	212
	Formula 24	73	150	228	363
	Formula 25	34	68	92	145
	Formula 26	363	708	1049	1502
	Formula 27	131	267	391	566
	Formula 28	157	307	457	719
	Formula 29	72	138	204	301
	Formula 30	87	182	261	416
	Formula 31	122	276	414	647
Brand 3	Formula 32	153	257	455	715
	Formula 33	122	240	447	591
	Formula 34	70	141	257	423
	Formula 35	154	325	497	648
	Formula 36	172	372	692	990
	Formula 37	192	371	480	1021
	Formula 38	104	215	333	537
	Formula 39	121	265	450	626
Brand 4	Formula 40	763	1343	1910	2801

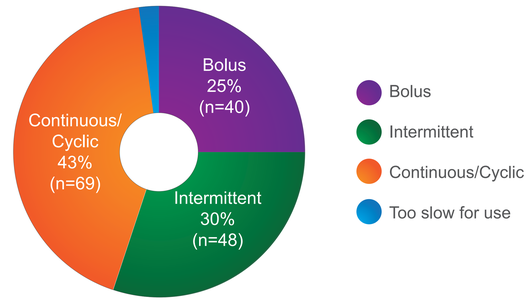

Figure 1: Flow Rates of the Novel EFS when categorized into bolus, intermittent and continuous/cyclic flow rates

According to the ASPEN Enteral Nutrition Handbook, a bolus feed is defined as taking a specific volume of EN formula over a short period of time (<30 mins). An intermittent feed is defined as administering a specific volume of EN formula over a longer period of time (e.g 30-60mins). The flow rate range for continuous feeding over 24 hours can range widely, from <50ml/hr to greater than 150ml/hr in adults.

In this study, flow rates were defined as >501ml/hr (bolus), 251-500ml/hr (intermittent) and 20-250ml/hr (continuous/cyclic). Flow rates for each EN administration method were compared to the flow rate results of the novel EFS, and displayed via pie chart (see Figure 1). Majority (43%) of these flow rates were <250ml/hr (suitable for continuous or cyclical feeding), 30% were intermittent feeding rates (251-500ml/hr), while 25% were bolus rates (>501ml/hr).

CONCLUSION:

The novel EFS provides a wide range of flow rates when used with various commercial EN formulas.

The Novel Enteral Feeding System can deliver formula at rates suitable for continuous, cyclical, intermittent and bolus feedings.