

Knowledge Management

Prof Jean K SOLER and Dr Gordon MARNOCH

“Define “knowledge management” in the primary care context, and conduct a critical appraisal of the effectiveness of knowledge management in the primary care system you practice in.”

This article is largely derived from an assignment submitted in by the first author in January 2006 as part of a Masters in Primary Care and General Practice near the University of Ulster in Northern Ireland. The essay was written for the purposes of summative assessment of the module on “Commissioning, Leadership and Management” led by Dr. Gordon Marnoch. The assignment question was: “Define “knowledge management” in the primary care context, and conduct a critical appraisal of the effectiveness of knowledge management in the primary care system you practice in.”

1. Define what the term “knowledge management” means in the context of primary care.

Knowledge Management (KM) aims to improve the utilisation of intellectual capital in organisational networks (Cummings, 2001; Stewart, 1997; Teece, 2000) through a process of creating, acquiring, capturing, aggregating, sharing and using knowledge to enhance organisational learning and performance (Scarborough *et al.*, 1994). Sensky (2002) outlines the distinctions and interdependence between data, information, knowledge, and expertise. KM in the primary care context involves maximising opportunities for information flow and knowledge creation such as audits, problem investigations, and performance appraisals (Carroll and Edmondson, 2002) with the aim of interrogating and ultimately improving existing approaches to health care quality (Bate and Robert, 2003).

2. Conduct a critical appraisal of the effectiveness of “knowledge management” in the primary care system you practise in.

The author manages a private community-based clinic oriented towards holistic health care, hosting 30 practitioners, including GPs, medical specialists and primary health care professionals, organised as multidisciplinary service-oriented teams. This model depends on patient-provider and inter-provider communication and KM is a critical element, implemented through the systematic collection of patient care data in electronic medical records (EMR) shared over a network; systematic information gathering and

communication between specialists and GPs (including formal letters for each encounter) effectively forming a community of practice (COP); sharing of information reports based on audits of practice processes; and practice meetings with an open agenda to explore information and generate new knowledge. However, the creation, sharing and review of explicit information do not ensure effective KM (Sensky, 2002). Much clinical knowledge is tacit, and its effective sharing has been shown to be problematic (Sensky, 2002; Bate and Robert, 2003). Sharing of tacit knowledge is catalysed at the clinic by encouraging practitioners to work together in structured teams, which exhibit mutual engagement, joint enterprise and a shared repertoire, thus exemplifying a COP (Wenger, 1998). Most teams have one weekly session where all members work together during a clinic session, affording opportunity to observe and share each other’s work, encouraging sharing of skills and information, and knowledge creation. An open-door policy is adopted explicitly, where team members (professionals and staff alike) can discuss problems as they arise, and share experiences with each other and the clinic manager at all times.

KM requires information systems to create knowledge about practice, and to support needs assessment and audit (Walsham, 2002). The clinic EMR is Transhis (Hofmans-Okkes and Lamberts, 1996), and it is designed to capture data on patient’s symptoms, doctors’ interventions and diagnostic labels during patient-doctor encounters. The tool used for data aggregation is the World Organisation of Family Doctors’ International Classification of Primary

Care, ICPC-2-E (Okkes *et. al.*, 2000), and the author has published aggregated data on needs and care provision from local practices (Soler and Okkes, 2004). To exemplify KM in practice this report will tackle needs assessment and care processes for asthma sufferers, and then GP referrals. The data was collected from 2001 to 2004, covering patients that use the clinic GPs as their primary point of care (table 1).

Clinical care of asthma

Asthma is the most common chronic disease managed (table 2, table 3). Intervals between encounters in episodes of asthma care (table 4) indicate that 89% of patients are reviewed at least once a year and 74% every six months. Although follow up seems to be adequate according to local guidelines (Malta Lung Study Group *et. al.*, 1998) it is difficult to ascertain whether those patients who do not consult regularly do so because of optimal control or rather, due to non-adherence. Table 5 describes the distribution of prescriptions, and it appears that rescue medication (bronchodilators) is prescribed slightly more than inhaled steroids, suggesting poor control. The rapid decay in rates of prescriptions per patient in all drug classes indicates possible non-adherence, or obtaining of repeat prescriptions elsewhere.

This information was reviewed during a KM-oriented practice meeting. Team members attempted to define patient needs, review processes of care, and analyse information into tacit (e.g. some doctors are asthmatic) and explicit knowledge (e.g. guidelines). Team approaches to asthma care were reviewed, as well as the roles of the GP, the physiotherapist, and the psychologist regarding difficult cases (e.g. adherence in teenage asthmatics). A new proactive approach to asthma care was proposed, including: critical review of a local guideline for asthma (Malta Lung Study Group *et. al.*, 1998) within a formal KM process (Evans, 2001; Fennessy, 2001) against inherent team member 'mindlines' that may influence practice (Gabbay and le May, 2004); regular review of patient symptom scores, medication and attitudes to adherence; the purchase of a lung function test machine; and implementation of a recall system for asthmatics who do not consult at least one a year. It was agreed to time the recall before autumn, when control often worsens (table 6). Community pharmacists have been invited to a future meeting to discuss medication adherence and prescription refill.

Referrals to other providers

Another KM exercise utilised GPs' EMR data on referrals to primary and secondary care professionals, within

and without the clinic (table 7). The clinic primary care team potentially cater for 70% of the base population's referral requirements, the notable exception being the 13% of referrals to the district nurse. However the clinic's specialist medical services potentially cater for only 47% of the population's needs, two notable issues being referrals to emergency services and surgeons (accounting for 37% of the total). Including an ophthalmologist in the clinical team could improve this datum by 10 percentage points. Analysis of patient referral requests (table 8) indicates that primary care referrals are requested for locomotor system problems (mainly physiotherapy) and specialist medical referrals for skin, locomotor and cardiovascular system problems. Recent local research indicates that such requests are closely adhered to by doctors (Soler and Okkes, 2004). However, besides complying with these explicit requests GPs also refer patients for many other conditions (table 9). This information strongly supports the GPs' roles of gatekeeper and care co-ordinator (Starfield, 1992).

Information is problematic (Sensky, 2002), and often incomplete or equivocal. For example, it was not possible to analyse the proportion of referrals that return feedback letters. Available and incomplete information was discussed during a team meeting, and it was agreed to formalise the process of providing feedback letters to GPs at every consultation. The recruitment of new professionals in the care teams was also discussed extensively. The information suggests that the recruitment of an ophthalmologist and community nurse would allow significantly more referrals to be kept "in house". However, the latter service is accessible for free within the NHS, and thus the clinic cannot compete directly using a private service on fee-for-service basis. The recruitment of an ophthalmologist was also attempted, but human resources were unavailable. Follow-up team discussion suggested the option of recruiting a colleague from another EU state.

Conclusion

The process of processing data into information to support organisational learning was examined through case studies of care for asthma and patient referrals in the context of a multi-disciplinary community clinic. Team interaction and community of practice facilitated transfer of tacit knowledge, whilst formal team discussion of explicit information allowed team solutions to be developed to address unmet needs through bottom-up leadership. Data system limitations, human resource problems and information uncertainty exemplified obstacles to effective organisational learning.

Table 1: Base practice population (a – sex-age table, b- graphical).

All listed patients are included for the four-year period of observation (2001-2004).

a) sex-age table

	Men			Women			Total	
	N	Col%	Row%	N	Col%	Row%	N	Col%
0-4	16	3.7	43.2	21	4	56.8	37	3.9
5-14	66	15.2	48.9	69	13.1	51.1	135	14.1
15-24	70	16.2	44.9	86	16.3	55.1	156	16.3
25-44	144	33.3	46.2	168	31.9	53.8	312	32.5
45-64	101	23.3	43.5	131	24.9	56.5	232	24.2
65-74	24	5.5	45.3	29	5.5	54.7	53	5.5
75+	12	2.8	35.3	22	4.2	64.7	34	3.5
Total	433	100	45.2	526	100	54.8	959	100

b) population graph

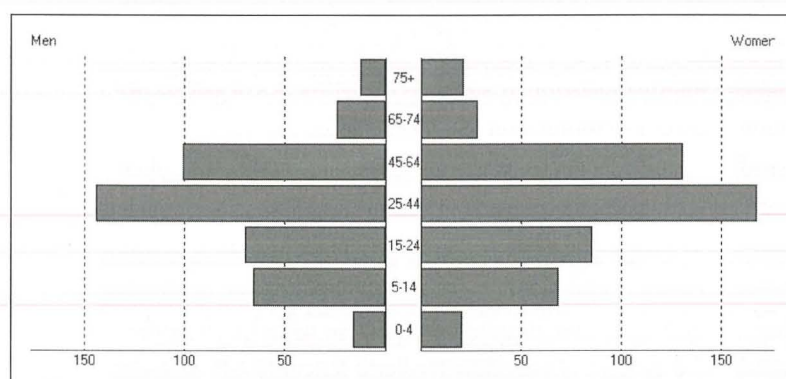


Table 2: Top 20 diagnoses in the base population (2001-2004).

	Code	Label	N	p1000py	%	Cum. %
1	R74	Upper respiratory infection acute	766	240.5	7.8	7.8
2	A98	Health maint/preventive medicine	594	186.5	6.1	13.9
3	R96	Asthma*	380	119.3	3.9	17.8
4	R97	Allergic rhinitis	362	113.6	3.7	21.5
5	D73	Gastroenteritis presumed infection	295	92.6	3	24.6
6	K86	Hypertension uncomplicated	270	84.8	2.8	27.3
7	P76	Depressive disorder	218	68.4	2.2	29.6
8	L18	Muscle pain	216	67.8	2.2	31.8
9	T93	Lipid disorder	211	66.2	2.2	33.9
10	A97	No disease	202	63.4	2.1	36
11	K87	Hypertension complicated	183	57.4	1.9	37.9
12	A85	Adverse effect medical agent	176	55.2	1.8	39.7
13	T90	Diabetes non-insulin dependent	157	49.3	1.6	41.3
14	R77	Laryngitis/tracheitis acute	150	47.1	1.5	42.8
15	P01	Feeling anxious/nervous/tense	150	47.1	1.5	44.4
16	A91	Abnormal result investigation NOS	146	45.8	1.5	45.9
17	P06	Sleep disturbance	139	43.6	1.4	47.3
18	P74	Anxiety disorder/anxiety state	129	40.5	1.3	48.6
19	H70	Otitis externa	96	30.1	1	49.6
20	N17	Vertigo/dizziness	85	26.7	0.9	50.5
		Total	9760	3063.7	100	100

* Asthma is the most frequent chronic disease managed.

Table 3: Prevalence and annual incidence of asthma by age-sex group in the base population (standardised for the national Maltese population in 2002)

a) age-sex distribution of prevalence per 1000 patient year: 12.4% in males and 9.9% in females

	Men			Women			Total		
	paty	%	p1000py	paty	%	p1000py	paty	%	p1000py
0-4	27.1	8.3	187.5	25.9	7.4	142.9	52.9	7.9	165.7
5-14	69.2	27.4	242.4	65.1	20.8	159.4	134.3	24.4	202.2
15-24	76.1	21.3	171.4	71.5	15	104.7	147.6	18.5	139.1
25-44	139.7	17.4	76.4	135.3	27.5	101.2	275	21.9	88.6
45-64	129.6	18.8	89.1	132.4	26.4	99.2	262	22.2	94.2
65-74	33.2	6.8	125	42.4	0	0	75.6	3.7	55
75+	20.6	0	0	32	2.9	45.5	52.5	1.3	27.7
Total	495.5	100	123.7	504.5	100	98.8	1000	100	111.1

Table 4: Intervals in episodes of care of asthma (ICPC-2-E code R96)

Note: 89.2% of asthmatics have at least one encounter a year; 74.3% at least once every six months (data not tabulated).

b) incidence of new episodes of asthma, year by year (mean annualised incidence: 0.9% in males and 1.1% in females)

Year	2001	2002	2003	2004	Total
Numerator (M)	40	47	50	53	190
Numerator (F)	68	62	44	70	244
Denominator	4258	5394	5759	5943	21396
Rate (M)	0.9%	0.9%	0.9%	0.9%	0.9%
Rate (F)	1.6%	1.1%	0.8%	1.2%	1.1%

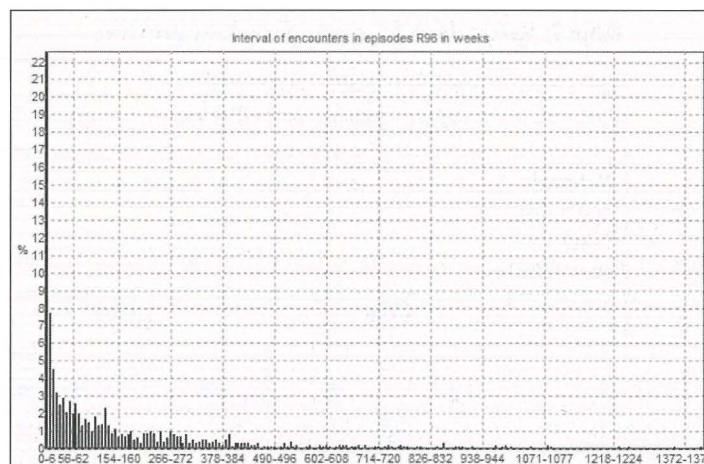


Table 5: Prescriptions per episode of care of asthma

(a) prescribed drugs for episodes of care of asthma, aggregated by ICPC drug groups and number of prescriptions per episode

Code	Label	Total episodes	1	2	3-4	5-9	10-14	15-19	20+	N
1 R20	Inhaled bronchodilators (sympaticomimetic)	632	428	95	64	35	6	3	1	1171
2 R22	Inhaled steroids	561	380	79	67	24	8	2	1	1062
3 T71	Glucocorticoids	135	105	13	13	4	0	0	0	204
4 R24	Systemic sympathicomimetics	57	48	4	5	0	0	0	0	73
5 R32	Expectorants	22	17	2	2	1	0	0	0	35
6 R21	Inhaled bronchodilators (anticholinergic)	11	3	4	3	1	0	0	0	28
7 R40	H1-antihistamines	20	16	1	3	0	0	0	0	27
8 A06	Macrolides and lincosamides	18	15	2	1	0	0	0	0	22
9 D64	Intestinal antiinflammatory agents	12	9	1	2	0	0	0	0	17
10 N12	Paracetamol and derivatives	11	11	0	0	0	0	0	0	11
	Total	1519	1065	204	164	65	14	5	2	2702

(b) number of prescriptions (by ICPC drug code) per patient in graphical format

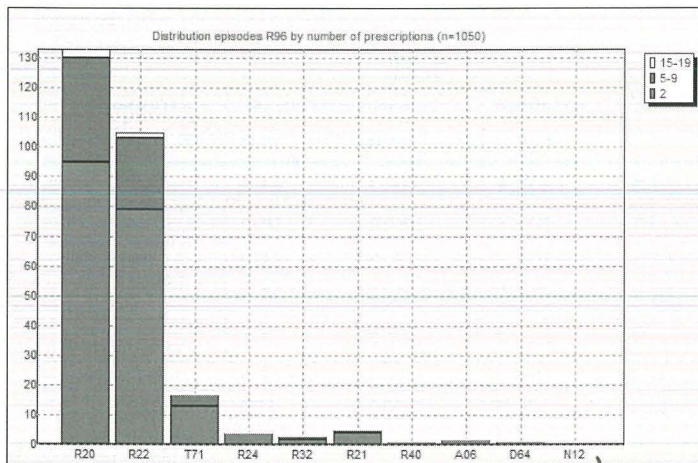
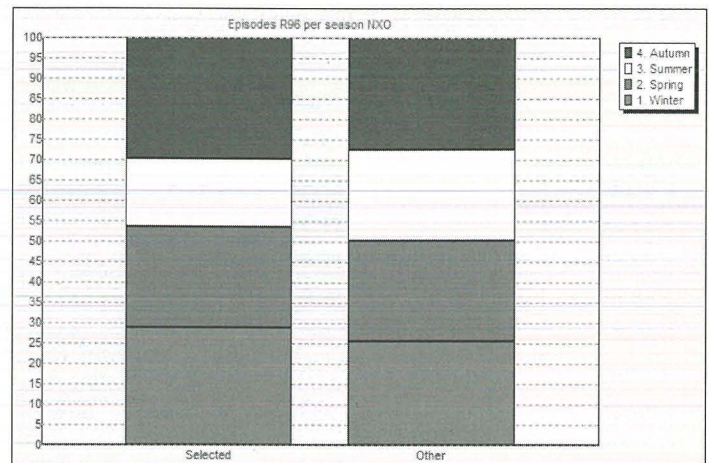


Table 6: Seasonality of asthma encounters (selected, R96) against all other diagnoses



Note: in autumn and winter the number of encounters for asthma are proportionately greatest.

Table 7: Referrals in four year period, by provider

Note: GP to GP referrals not considered as a referral

a) referrals to primary care specialists (non-GP primary care professionals)

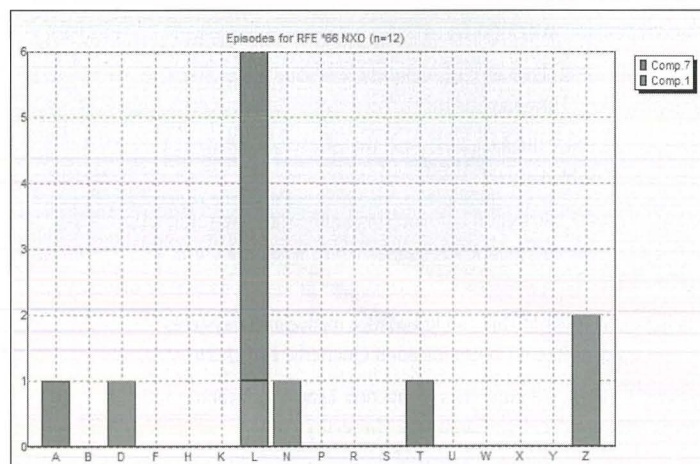
Referrals specialist NXO (n=9760)						
	Code	Label	N	p1000py	%	Cum. %
1	10	Internist	46	14.4	12.7	12.7
2	4	Surgeon	38	11.9	10.5	23.3
3	17	Eye-surgeon	34	10.7	9.4	32.7
4	60	Emergency Internist	34	10.7	9.4	42.1
5	18	Orthopedic surgeon	31	9.7	8.6	50.7
6	5	Dermatologist	30	9.4	8.3	59
7	12	E.N.T. surgeon	24	7.5	6.6	65.7
8	54	Emergency Surgeon	19	6	5.3	70.9
9	8	Gynaecologist	15	4.7	4.2	75.1
10	16	Neurologist	9	2.8	2.5	77.6
11	20	Psychiatrist	8	2.5	2.2	79.8
12	6	Gastroenterologist	8	2.5	2.2	82
13	62	Emergency E.N.T. surgeon	7	2.2	1.9	83.9
14	13	Pediatrician	7	2.2	1.9	85.9
15	72	Emergency Urologist	6	1.9	1.7	87.5
16	66	Emergency Neurologist	4	1.3	1.1	88.6
17	14	Pulmonologist	4	1.3	1.1	89.8
18	55	Emergency Dermatologist	4	1.3	1.1	90.9
19	70	Emergency Psychiatrist	4	1.3	1.1	92
20	67	Emergency Eye-surgeon	4	1.3	1.1	93.1
		Total	361	113.3	100	100

b) referrals to secondary care specialists (non-GP specialist doctors)

Referrals primary care NXO (n=9760)						
	Code	Label	N	p1000py	%	Cum. %
1	F	Physiotherapist	55	17.3	29.6	29.6
2	T	Dentist	26	8.2	14	43.5
3	P	Psychologist	26	8.2	14	57.5
4	W	District nurse	24	7.5	12.9	70.4
5	L	Podologist	19	6	10.2	80.6
6	X	Other referrals	16	5	8.6	89.2
7	M	Social worker	5	1.6	2.7	91.9
8	D	Nutritionist	4	1.3	2.2	94.1
9	H	Practice nurse	3	0.9	1.6	95.7
10	S	Prosthetic devices	3	0.9	1.6	97.3
11	R	Social advisor	2	0.6	1.1	98.4
12	Z	Home care	2	0.6	1.1	99.5
13	G	Group therapy	1	0.3	0.5	100
		Total	186	58.4	100	100

Table 8: Explicit referral requests presented by patients to the GP, charted by ICPC chapters

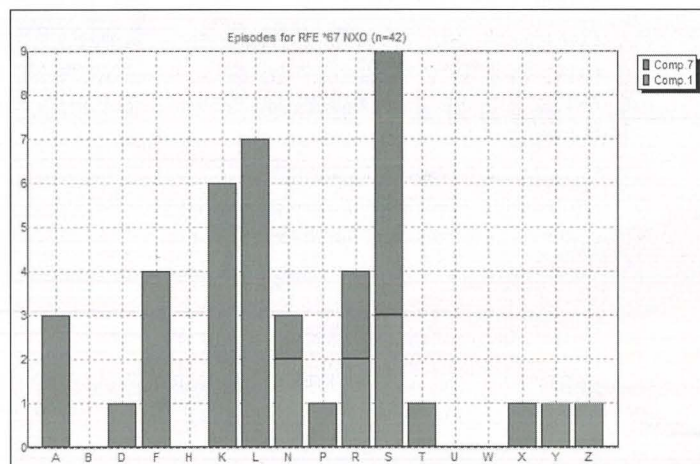
a) patient requests for referral to primary care providers, by ICPC chapter



Note: component 1 refers to symptoms (e.g. "I have back pain"), component 7 refers to complaints expressed as diagnostic titles (e.g. "I have sciatica")

ICPC Chapters: A – general; B - blood, immune system; D – digestive; F – eye; H - ear (hearing); K – circulatory; L – musculoskeletal; N – neurological; P – psychological; R – respiratory; S – skin; T - metabolic, endocrine; U – urological; W - women's health, pregnancy, family planning; X - female genital; Y - male genital; Z - social problems.

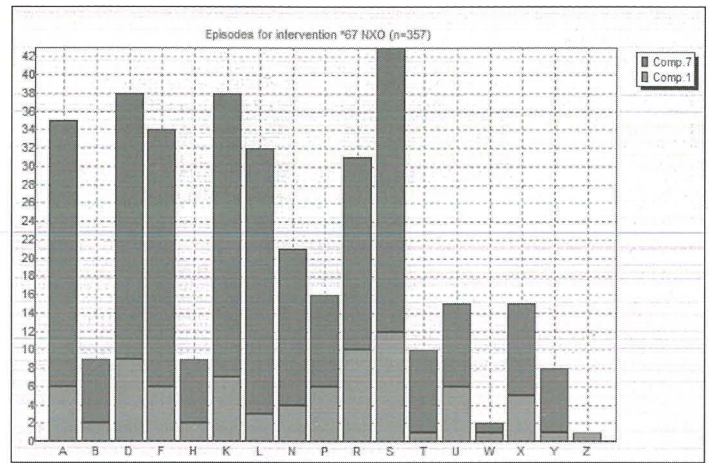
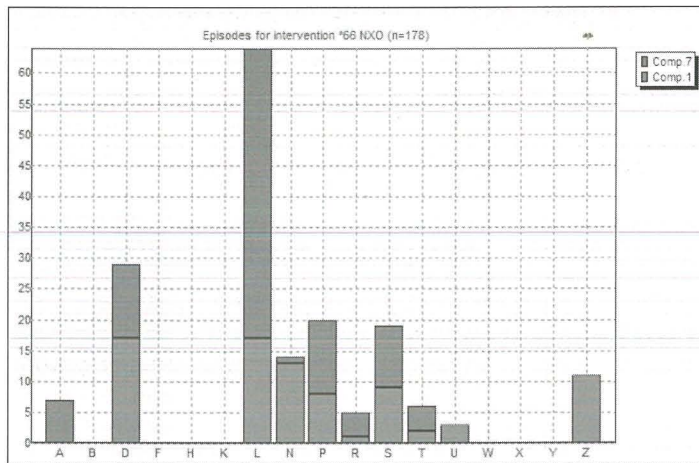
b) patient requests for referral to a medical specialist, by ICPC chapter



Note: component 1 refers to symptoms (e.g. "I have back pain"), component 7 refers to complaints expressed as diagnostic titles (e.g. "I have sciatica")

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Table 9: Actual GP referrals, by ICPC chapter of diagnostic title (a) primary care referrals and (b) secondary care referrals



ICPC Chapters: A – general; B – blood, immune system; D – digestive; F – eye; H – ear (hearing); K – circulatory; L – musculoskeletal; N – neurological; P – psychological; R – respiratory; S – skin; T – metabolic, endocrine; U – urological; W – women’s health, pregnancy, family planning; X – female genital; Y – male genital; Z – social problems.

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Prof Jean K SOLER
Dr Gordon MARNOCH

Corresponding author: Prof. Jean K Soler MD MSc MMCFD