Cancer research capacity in low- and middle-income countries: An attempt at a comprehensive NGO perspective

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The uneven development of research capacity in low- and middle-income countries (LMICs) provides a rationale for the present focus on academia, granting bodies, career opportunities and the publication world, which all impact on the motivation and ability of students to engage in research. Factors such as appropriate supervisor availability, an academic environment capable of nurturing specialist training, funding bodies and reasonable expectations of success, all affect how NGOs and research groups, as well as official external actors, might contribute to improvement.

As a privileged European scientist who has been intimately involved in an Asian-Pacific project for cancer prevention since its inauguration in 1999, the first author has had many opportunities to interact with student scientists from central, western, southern, south-eastern and north-eastern Asia – for many years my major role was to reach out and provide on-site training opportunities. Many of the conclusions drawn below are based on personal experiences of actual situations. For privacy reasons, I have avoided names of any individuals involved and would appreciate the readers respect of this principle. Some of what is discussed may be only pertinent to a small subset of low- and middle-income countries (LMICs), but it is hoped that the arguments made might resonate with groups which are already active but would wish to increase their potential. While significance for the developed world may be limited, we can never forget that research and publication policies are largely set in the first world. Is the playing field level at present? If not, can we do anything concrete about it?

Some people can be lucky, invited by an established scientist to study for a PhD under regularly-available guidance, with a reasonable stipendium to take care of all financial woes, and no problems with research materials. And naturally a very good contact with a reputable journal where the first papers were rapidly accepted. The United Kingdom in 1973 is a far cry from a student in an LMIC today who must pay for the privilege of studying to become one of the competent research scientists his or her country will need in the future. Those that nevertheless follow this path therefore deserve our particular respect and attention.

Figure 1: Major players in the research world

One simplification of the research world in which we live is depicted in Figure 1, with four "players" impacting on student research activity, individual factors being highlighted.

Academic Authorities

Universities colleges and specialized research institutes provide the academic environment for research into cancer control. They provide the physical environment, the libraries, laboratories, seminar rooms and on-line access facilities. The research environment, much more nebulous, will depend partly on whether there is emphasis on home or visiting

professor speakers (including making full use of opportunities offered by "prestigious" figures attending conferences) and journal or other discussion clubs. Here, cultural elements may become important. Whether universal emulation of the system of daily 8.00 - 9.00 alternate journal and pathology case reports, Monday to Friday, which was routine (compulsion was never mentioned but attendance was always 100%) in one laboratory of my acquaintance, can be recommended, is a question I leave to the reader. However, the situation of strict rotation with every member of the group, top to bottom, having to take their turn to make a presentation to their colleagues gave valuable experience.

How do you optimize academic research environments to facilitate student involvement? First of all, an awareness of the benefits of the real world of science may be inculcated, the possibility of interacting with other scientists of diverse cultures (and maybe even visiting for conferences or cooperative studies), perhaps jobs at the end of the rainbow, international careers even for those so inclined. Clearly the academic institution has a major role as a conduit for research funding, either from government or private sources. The research which presumably will be of most practical significance for society will concern one or more of the NCDs which account for approximately 80% of premature deaths across Asia according to World Health Organization (WHO) statistics. Whatever stance one takes on the freedom of individual researchers to choose their theme of interest, it is a fact of life that the availability of grants will be a determining factor in what research is actually conducted. And, naturally, the availability of experienced leaders will be pivotal.

One recourse is to invite foreign faculties to stage training courses, with possible longer term follow-up support. However, if one is invited to provide "epidemiology research and publication" training at two separate universities in one LMIC and find no active interest in cancer research from any of the large number of post-graduate students, then it should be no surprise to learn that the supervisors basically deciding on their themes (as everywhere in the world) all have experience focused on infectious disease. Of course, this is anecdotal but many active in international cooperation can vouch for this. Unless there is active intervention at the policy level on either appointing scientists with relevant experience to act as supervisors, or targeting the goals of present faculty, it is difficult to envisage how a cancer research environment could be optimized. Should there be greater focus on public health modules in LMIC universities in the future *(1)*? One could envisage links between academic institutions focusing more attention in NCDs and other global actors, so that policy and funding priorities are taken into account *(2)*. It has been stressed that multifactorial action is necessary to address NCD control *(3)*.

The possibility that many more students from LMICs might take up research training opportunities in the developed world also might reward more attention. One institution offering exactly that is the National Cancer Centre in Korea which includes the Departments of Cancer Control and Population Health, Cancer Biomedical Science and Cancer AI & Digital Health (https://nccgcsp. ac.kr). The possibility of providing initial training followed by a period of research at the home institution before finally submitting a thesis has been explored at Tampere University. Whether a system could be devised to allow LMIC scientists to find all individual leading scientists with access to appropriate grants for PhDs through a network, perhaps set up by the APOCP NGO, might also warrant our interest. Could our organization garner support from established granting bodies like the Wellcome Trust, NIH and many Foundations, by maintaining a better understanding of mutual concerns?

Granting bodies

Are there grants available? From whom? For whom? How are they advertised? How to remove serendipidity? Anecdotes about chance reading of advertisements leading to successful projects are rife. Optimally, all information about conceivable opportunities would be comprehensively available to possible applicants – whether individual institutions would have the resources to effectively monitor the funding world, however, is a question we will return to below, along with the question of actively generating financial resources.

Employment World

In many parts of the world, there is keen competition for professorial positions which are effectively permanent. The criteria for selection usually include a very impressive publication list. This guarantees an abiding interest in research and publication. However, whether this carrot is appetizing may be a policy question in certain circumstances, for example in countries with a rotation of departmental heads by vote, with political skill perhaps carrying more weight than publication history.

Whatever the case, the needs of prospective employers, whether they be government (academia, hospitals, institutes) or private (pharmaceutical and other industrial concerns, NGOs) might be taken into account to stimulate interest in particular research projects. A comprehensive understanding of the expectations of the employment world and their use to incentivize could conceivably be part of any capacity building programme, as argued by Akselrod and her group *(3)*.

Publication world

Last but not least of our four players, we turn to the publication

world, with its PubMed and SCI listings. Cost is important but many academic institutions are now in a position to afford support, as any perusal of where LMIC scientists are publishing will confirm. Journal policy is of more essential significance – where the emphasis is on maintaining or improving an "Impact Factor" it is difficult to maintain a level playing field. Even editors are human beings and we should appreciate their service, but one may hope that consideration of the difficulties facing many students and their supervisors in LMICs be given greater priority. One approach to overcome such problems might be to form associations, not only to launch new journals but to stimulate interaction through meetings and promotion of cooperative efforts. International, contacts with influential individuals can be of prime importance, and the right co-author may go a long way to serious consideration and even perhaps acceptance for publication. The question of quality of articles demands comment.

In a perfect world a set of criteria might become established to guide both authors and reviewers as to priority for acceptance and how best to overcome insufficiencies. Possible items for inclusion are listed in Table 1.

If there is a journal in an area of expertise, listed on PubMed if possible, that positively reviews work from all countries, wherever they might be – then the likelihood of an article from an LMIC entering the public space increases. The positive role that the APJCP has played in the region is evident from a comparison of the citations listed in comprehensive reviews of cancer registration, breast, cervix and colorectal cancer epidemiology conducted by scientists in Asia (see Table 2). The reviews attempted to be as comprehensive as possible but even with any bias due to the selection of contents for inclusion the results are very revealing – over half of the total references were from only one of the total of over 80 journals listed.

Table 1: Possible Criteria for Article Quality

Pertinence of overall theme
Pertinence of specific theme
Competent rationale
Appropriate methodology
Appropriate results presentation
Competent interpretation
Level of novelty
Appropriate references, comprehensive / up-to-date
Language competence

I am sure that if this were updated, a similar picture would emerge. A perusal of the recent publication lists of many of leading cancer researchers in many LMIC parts of Asia would continue to reveal strong utilization. Such journals might have more roles to play in the future but another anecdote is pertinent here. The very same journal was removed from SCI Expanded listing (without any warning or even information that it had occurred) and when a request for explanation was requested, the reply was too rapid growth in number of publications accepted, despite a rejection rate of 60% (too

Table 2: Journal Contributions 2015-2019

Journal Name	Reg	Br	Cerv	CRC	Total
Acta Med Indones	0	1	0	2	3
Asian J Surg	0	0	0	2	2
Asian Pac J Cancer Prev	10	61	57	41	169
Asia Pac J Public Health	0	1	0	1	2
BMC Cancer	1	1	1	1	4
BMC Med	0	0	2	0	2
BMC Public Health	0	0	2	1	3
BMJ Open	0	2	0	2	4
Br J Cancer	2	4	2	1	9
Cancer Epidemiol	0	3	0	0	3
Eur J Cancer Prev	0	1	0	1	2
Infect Agent Cancer	0	1	2	0	3
Int J Cancer	0	3	0	0	3
J Epidemiol	0	4	0	0	4
J Med Assoc Thai	0	3	0	1	4
Jpn J Clin Oncol	2	0	0	1	3
Med J Malaysia	0	2	1	2	5
PLoS One	0	7	1	0	8
Prev Med	0	2	0	0	2
Singapore Med J	1	1	1	2	5
Support Care Cancer S	0	1	0	1	2
pecialist*	0	8	13	4	25
Other	1	16	13	8	34
Total	**17**	**122**	**95**	**70**	**310**

*Reg, Registry; Br, Breast;, Cerv, Cervix; CRC, colorectal; * Br - Breast, Breast Cancer Res, Breast Cancer Res Treat, Clin Breast Cancer, Int J Breast Cancer; Cerv - Gynecol Oncol Rep, Int J Gynecol Cancer, Int J Gynaecol Obstet, J Gynecol Oncol, Papillomavirus Res, Vaccine, Value Health Reg Issues; CRC - Colorectal Dis, Dig Dis Sci, Intest Res, J Gastrointest Oncol, World J Gastroenterol*

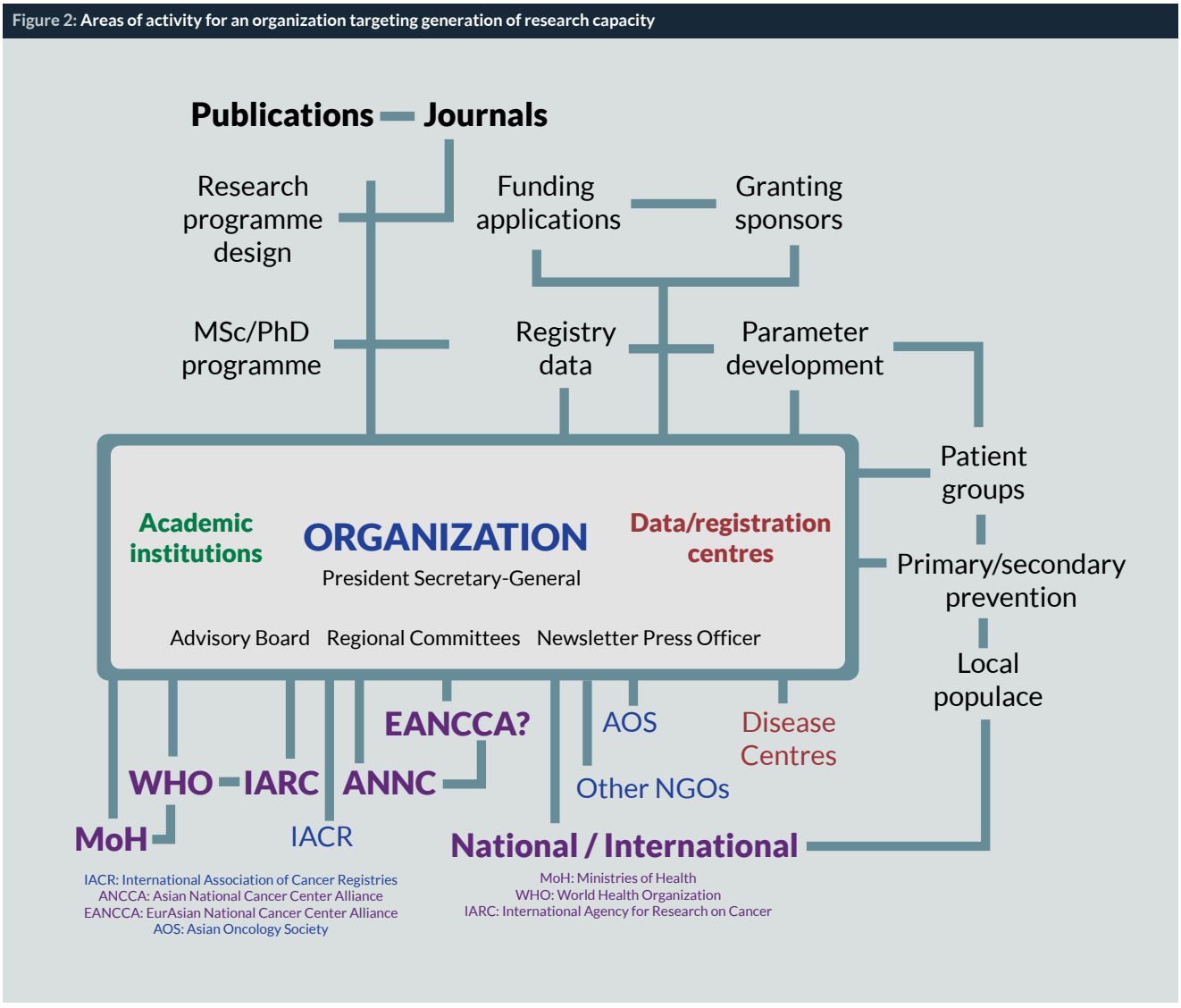
many new scientists being added to the research world?) and excessive self-citation (of other articles appearing in the same journal). If scientist A cites relevant works from his countrymen, the fact that in many cases almost the only journal which had acted as a forum for their publications is that under attack was not regarded as a compelling argument for reconsideration.

International players

One influence not included in Figure 1 concerns international players. Focusing on cancer research, there are the official actors like the World Health Organization and its Regional as well as Country Offices, the International Agency for Research on Cancer with its Hubs and the International Atomic Agency with its imPACT reviews. How they might impact on research capacity needs more in depth assessment. However, it is clear that much can be done in the way of provision of training courses, like the Summer School Programme of IARC.

National efforts may include international training programmes, like that targeting south-east and central Asia by the Aichi Cancer Centre in cooperation with the Japanese International Cooperation Agency *(4)*. Over a two-month period, groups received training in cancer epidemiology and prepared to perform particular projects on their return home. The political choice mostly of ministry workers (to enjoy generous Japanese hospitality) meant that only a few candidates could be included from academia, but these were individuals much more likely to fulfill their promise and continue a career actively publishing in the field. This is not a criticism of individual ministry workers but rather the difficulties when job rotation is a fact of life. The very well-meaning Young Leaders Programme of Nagoya University, targeting promising country ministry staff and offering one year generous facilities, resulted in many of the now English-fluent participants being head-hunted by foreign NGOs offering multiples of local salaries immediately on return to their home countries. The moral of the story is that careful consideration in choice of candidates' acceptance in training programme, where space or resources are limited, might be rewarded.

Figure 2: **Areas of activity for an organization targeting generation of research capacity**



One can conceive of a training course whereby contact and support are maintained long after the completion of the first tuition – right until completion of at least the first publication in a peer-reviewed journal. Far more of a responsibility that is generally assumed or even possible given human resource restraints, but one which can be taken up by a non-government organization with appropriate volunteer support. There are scientists in LMICs who, given initial support, for example to set up a cohort, go on to host innumerable MSc and PhD students, each of which could be successfully assisted in the publications necessary for their graduation. Such individuals are rare jewels. Our question concerns whether their nurture is feasible?

A research organization can also help by promoting cross-sectional studies of nurse and medical students who would thereby be exposed as subjects in meaningful research, after appropriate provision of rationale and utility, as well as eventually results as appropriate. These types of study can be inexpensive with a relatively simple methodology, so that most institutes would be capable of organizing them without the necessity of major external input. Setting up international patient cohorts, on the other hand, could be facilitated by international cooperation, as exemplified by the COST study *(5)*. The potential of this approach, with an NGO teaming up with the pharmaceutical industry to effect multi-institutional cooperation for cancer control problems of mutual interest, is enormous. What an NGO could achieve in such a project with the Asian National Cancer Center Alliance *(6)* strongly beckons at present. This would provide a massive boost to the training of registrar scientists and with effective governance, multiple opportunities for students to access the database generated to answer research questions. All under consideration of privacy learned from our combined experiences with cancer registries.

Some ideas about possible NGO activities to help research capacity building in an LMIC are illustrated in Figure 2. In addition to the obvious need to maintain close contact with academic and public institutions, especially those with databases, providing training within discrete areas of cancer control must be a priority. Involvement in many areas can be envisaged. A website which provides information on available courses, funding opportunities, advice on choice of journals for publication, overviews of selected subjects with comprehensive references, updated over time – this might be envisaged and would certainly be a help, especially if organized with reciprocal information transfer where possible.

But perhaps there is no substitute for an experienced researcher sitting down with a gifted student, discussing their research plan, the results obtained and how to best go about negotiating a way through the literature to craft a research article worthy of publication. Then another, with involvement of associated staff, and so on, developing a node of expertise, which will positively interact with other nodes in a spirit of cooperation, putting down strong roots in all the cancer research communities in Asia, and by extension the world. ■

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