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*Josep Taberno MD PhD, director of VHIO, introduces the important work being conducted by the cancer institute in Spain as well as emerging trends in oncology.*

**Can you tell us about VHIO?**

Established in 2006, the Vall dÂ´Hebron Institute of Oncology (VHIO) is a leading comprehensive cancer center of excellence that adopts a purely translational research model and harnesses multidisciplinary teams to both accelerate and advance personalized and targeted therapies against cancer. Located within the Vall dâ??Hebron Barcelona Hospital Campus, VHIO is a dedicated research center devoted to advancing cancer treatment and care. VHIO was born out of a strategic decision that was taken by the Vall dÂ´Hebron University Hospital more than 20 years ago to hone in on specific areas, including â?? because of an aging population â?? cardiovascular disease and cancer.

About 15 years ago it also became very clear that in order to have a primary area of research as well as secure international funding from the US, competitive agencies in Europe and other sources, it was critical have our own research organization. It is not however typically common to have these two spheres connected in one hospital, sharing the same location. VHIO is privileged in the sense that our Hospital affords it direct access to patients as well as the entire spectrum of oncology professionals who care for them.

As we began to develop unique competencies in the field of oncology, a second priority at VHIO was to have members of its board of coming from the private sector. Private for us can mean non-profit organizations with private governance. This is very important for us. VHIO launched in 2007 and at that time, the financial crisis struck. It would have been practically impossible to set up the new research institute with a new building without the private sector. Therefore, we are absolutely thankful to the CELLEX, FERO, La Caixa and BBVA Foundations for their continuous support to VHIO.

Even with the budgetary restrictions in place, we have successfully managed to expand our areas of research. The type of research that we carry out is highly patient-centric which means it must show strong translational promise and the potential to be applied to the clinic. We do not perform basic foundational research. As a Hospital, our patients come first and rightly remain at the center of everything we do. Furthermore, there are already several good centers in Spain that focus on fundamental cancer research and we certainly have no wish to duplicate activities, particularly in view of limited resources. Our added value is found in our purely translational and multidisciplinary uniqueness.

We have been integrating new principle investigators to respond to the needs that we have and tackle the essential questions that we still have about this disease towards improving patient care. For this reason, much of our core workload centers on clinical trials. We have undergone substantial internal development and invested heavily in upgrades relating to big data and digital thematics. Another area of focus involves the development of predictive cancer models that might help us to better understand the functional aspects of the disease and answer important questions about mechanisms of sensitivity as well as resistance to novel anti-cancer therapies.

With regards to clinical research, we are one of the three leading oncology centers in Europe. At our Hospital, we include around 1,200 patients with solid tumors in clinical trials, this representing 35% of the patients that need any kind of systemic treatment; 40 percent of these patients are enrolled in phase one, 30 percent in phase two, and 30 percent in phase three studies.

**If we look at the dynamics of cancer in Spain, it is becoming more of a chronic disease with more people surviving, but more incidents. Can you tell us about emerging trends?**

Essentially the prevalence of incidence is increasing because we are living longer. There are several other factors influencing incidence. For example, both the consumption of alcohol and tobacco as well as that of red meat and fatty foods are on the up. They are both important considerations.

Obesity is now an important cause of cancer as is radiation from the sun. We are aware that some of cancers are also related to viral infections such as HPB, HIV and hepatitis.

There are certainly others. For example, the increasing rate of breast cancer may be related, in part, to estrogen. The birthrate is decreasing. 50 to 70 years ago, women often had as many as ten pregnancies and of those, only three to five were successful. What matters in breast cancer is the number of months or years that women have not been exposed to estrogen. When you have been exposed to pregnancy, the level of estrogen decreases for at least a year. On average women usually have their menstrual cycle with higher levels of estrogen from ages 15 to 50, totaling 35 years. For this reason, there is a lot of interest and a great amount of research, for example, aimed at primary breast cancer prevention with drugs that can overcome the negative effects of estrogen and keep the good ones.

So, the challenge here is that cancer is going to be a big player in the future. There will be many chronic patients. Even those who are cured have to be treated. The incidence will almost certainly increase. In addition, we have the cured survivors. They have side effects from therapies, sometimes psychological or social side-effects. One of the problems we have right now is that when many of our patients who have thankfully survived cancer return to their conventional lives prior to their cancer, things are often not the same. The complexities in cancer treatment and care are myriad. That said, I firmly believe that we can collectively turn current challenges into opportunities towards improved outcomes for our patients.

**Financial sustainability is a big part of the challenge. Where should resources be allocated?**

40 percent of cancers are preventable. The tumors that can be prevented should not be here. Vaccination, prevention, colonoscopy, and early diagnostics, among others. One plan is to educate families and invite them in to discuss all the preventative measures.

There is some preliminary data that suggests treatment before surgery with immunotherapy leads to better results, depending on whether one can hopefully aim to cure or if not, prolong the survival of a given patient.

An interesting thing is that while there are strong complaints about the increase of drug prices, the reaction to rising costs is to delay full reimbursement of patient treatments. Once the EMA approves the drug, the price is set by the Ministry of Health. But that doesnâ??t mean you secure immediate reimbursement. Governments often delay reimbursement because they donâ??t have the budget. Combating cancer and prevention is expensive, but the drugs only account for 27-30 percent of the cost. The rest is primary care and hospitals etc.

For example, letâ??s consider the reality of treating a patient with melanoma. Ten years ago, the cost was USD 3,000-4,000. Nowadays, if you treat the patient for eleven months the estimated figure totals at USD 300,000-400,000 in the US. One increasingly common train of thought is that we should base the reimbursement model of the drug costs on the value of the drugs administered. Further, it is a hugely tricky task to compare percentages of budgets (between nations), never mind comparing efficiency within the budget. This means that the model of reimbursement should be adequated according to regional parameters, what is being called as geographically-adapted value-based reimbursement.

**In terms of the care continuum, there are a lot of care transitions, how does that play out in terms of the patient experience?**

For smaller regions, they often need help with patients in terms of special diagnostics, and then larger communities often have better facilities to offer optimal treatments. If weÂ´re talking about the

bigger regions, the continuum of care is good because primary care is good, and there is good interaction between the primary care and the hospitals. Primary care works really well, especially in relation to funding. Since the percentage for health is 7.5 percent, if you include the public sector, and increases to 8.5 percent if we include the private sector. So, for the budget the health model is quite efficient.

**You have just become the president of ESMO. Both with VHIO and ESMO, how are you trying to shift the paradigm of countering cancer, for example with liquid biopsy?**

At VHIO, we have been fortunate to have secured funding and support in new areas which are going to be very important. One particularly promising approach is of course liquid biopsy. Given that there are many different tumor types and that each is highly dynamic, we must develop tools and approaches that enable us to more accurately and effectively evaluate the dynamism of such a complex disease that is cancer. With liquid biopsy, for example, you get information from all the different areas of the tumor as a result. Also, every day we are witnessing new applications of liquid biopsy and opportunities for diagnosis especially in patients with tumors that have a very poor prognosis. We are applying liquid biopsy to several tumor types including lung, colorectal, pancreatic and ovarian cancers, for example. We are also seeing the promise of liquid biopsy in the follow up of patients without having to perform so many x-rays and scans.

Itâ??s all about adapting approaches to conventional care and rapidly evolving in tune with the current era of precision medicine in oncology. While Iâ??m sure we cannot anticipate what is going to happen in five yearsâ?? time, we can and will need to celebrate and embrace opportunities that discovery brings with it. Powerful technologies and other drivers of important change including big data, emerging apps and platforms will increasingly help patients as well as physicians to more effectively manage side effects and respond to the questions that a particular patient may have.

**Looking at all these changes, what about the future of hospital care in Spain. In the next three to five years what would you want to see with the hospital and the research center?**

In cancer care I want to see VHIO ranking high among the leading centers in oncology, expanding on its current research areas as well as developing novel and emerging technologies. We are at the point of a revolution in our efforts aimed at solving cancer sooner. Not only in terms of the array of powerful anti-cancer therapies but also in our unmasking of trickery employed by tumors to dodge and evade the effects of cancer medicines. Specifically, we are looking to immunotherapy, liquid biopsy, new technologies and the micro-biome as we continue to up the tempo in conquering cancer.

We have more genes in our body coming from outside than from ourselves. In our body 99 percent of genes are from outside of us. All of our cells have the same genome, but bacteria do not. There are so many different ones that our own genes are in the minority. The immune system reacts to our genes, to the good ones, to the bad ones that produce cancer, as well as to the many genes related to bacteria. This represents a critical area in the future; getting the good micro-biome.

So, for example, right now it is very clear that, not only because of resistance but also due to the way that we are changing our micro-biome, the use of antibiotics should be extremely restricted. Since they are changing the full composition of the body, only for severe diseases should we treat infections with antibiotics.

The bottom line is that we have to move faster and get smarter in our collective onslaught on cancer. We can and will do better.

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