

InCrowd COVID-19 Reports

Novel Coronavirus (COVID-19) Vaccine Development

Predictions and perceptions of vaccine development with infectious disease specialists

July 17, 2020

Methodology

CRITERIA

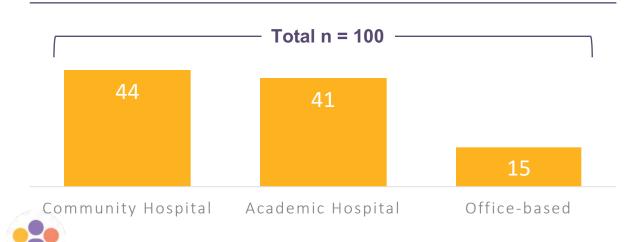
METHOD	10-Minute MicroSurvey via InCrowd
FIELDING PERIOD	June 26 th - July 6 th
CROWDS	Infectious disease doctors
SCREENING	Physicians identifying as at least somewhat familiar with vaccines in

development for COVID-19

Given the recent uptick in COVID-19 cases in the US, many InCrowd panelists have been reporting that they do not expect things to return to normal until a vaccine is developed and disseminated. In order to deepen our understanding of the COVID-19 vaccine landscape, InCrowd surveyed infectious disease specialists across the country to get their perception and predictions on the **efficacy**, **impact**, and **competitive landscape** of COVID-19 vaccines.

Please note, views in this survey reflect opinions only, as reported by responding physicians. Additionally, this data was fielded on June 26-July 6, 2020, prior to recent clinical trial announcements by vaccine developers.

N-SIZES & PRACTICE SETTING BREAKDOWN



Executive Summary

- Race to approval—Moderna is predicted to win amongst other players in the COVID-19 vaccine space, gaining the most votes among infectious disease doctors for first FDA approval, fastest manufacturing timeline, and first to be publicly available.
- Favorability—Moderna and AstraZeneca/Oxford are head-to-head in terms of physician perceptions on efficacy metrics, however, more believe that Moderna will be the one to deliver herd immunity and allow society to return to normal.
- Why Moderna?—Several physicians mention that Moderna's unique design will allow for both scalability and flexibility in manufacturing, giving it an edge over its competitors who will not be able to allow for the same levels of agility in production.
- Availability estimates—Physicians estimate an average of eleven months until a vaccine is publicly available, with over 80% expecting a vaccine within a year.
- Herd immunity estimates—Two-thirds believe that we will not reach herd immunity until more than 60% of the US population is vaccinated. On average, respondents find that the herd immunity threshold will be around 68%.
- Distribution priority—Close to three-quarters believe that healthcare workers should be among the top priority population if vaccine distribution is to be tiered, with the most vulnerable populations also ranking highly.
- Prevention practices—high proportions of physicians (around a third) expect that restricted visitation policies and universal mask wearing will remain even after a vaccine is made available and will not relax until herd immunity is achieved.



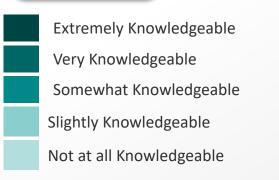
Familiarity with COVID-19 Vaccines

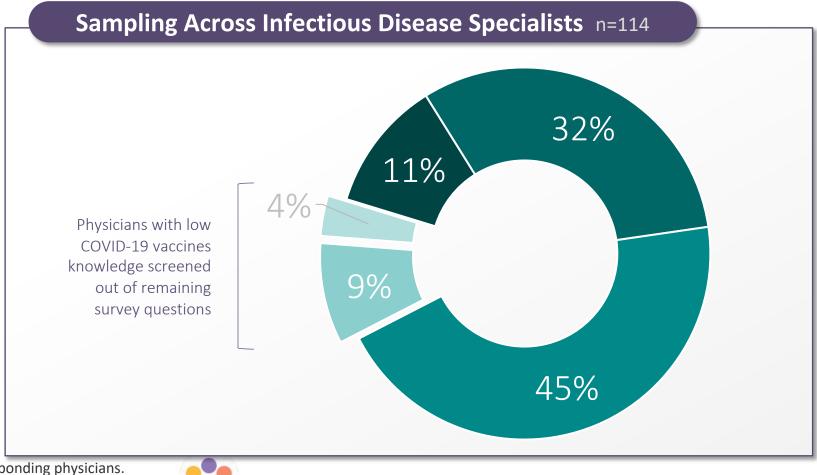
Among all sampled infectious disease doctors, 88% claim to have at least some knowledge of COVID-19 vaccine development.

S1a

How would you describe your level of knowledge about vaccines in development for COVID-19?

KEY





Unaided Recall of Companies Developing Vaccines

When prompted for names of companies with COVID-19 vaccines in their pipeline, close to two-thirds mention Moderna (63%), 42% mention AstraZeneca, and around a third mention both Pfizer and Johnson & Johnson.

S1b

What companies are you aware of that are developing vaccines?

D oorgoogle 11 1 2	
Responses Unaided Open-End	% Mentioning n=100
Moderna	63%
AstraZeneca + Oxford	42%
Pfizer + BioNTech	37%
Johnson & Johnson	32%
Merck	21%
Sanofi	14%
Inovio	13%
GSK	12%
Novavax	9%
Gilead	8%
Roche	4%
Abbott	3%
Abbvie	3%
CanoSino Biologics	3%
Vaxart	2%

Views in this survey reflect opinions only, as reported by responding physicians.



% Mentioning n=100

2%

2%

2%

1%

1%

1%

1% 1%

1%

1%

1% 1% 1%

5%

Unaided Recall of Vaccine MOAs (1/2)

Over a third of respondents are able to recall mRNA-mediated vaccine MOAs (like Moderna's). Other frequent MOAs respondents mention include use of DNA plasmids (27%) and spike proteins (21%).

Please list the
mechanisms of
action (MoAs) for
the different
COVID-19 vaccines
of which you
are aware?

Q1

Responses Unaided Open-End	% Mentioning n=100	Responses Unaided Open-End	% Mentioning n=100
mRNA mediated	36%	Fusion/entry inhibitors	7%
DNA-based	27%	Monoclonal antibodies	6%
Spike protein	21%	Neutralizing antibodies	6%
RNA-based	21%	Adjuvanted	4%
Inactivated virus	20%	Recombinant protein	4%
Live attenuated	13%	igG/antibody stimulating	4%
Vector/phage	11%	Virus-like particles	3%
Protein subunit	10%	Nanoparticle vaccine	3%
Antigen/antigenic fragments	8%	Molecular clamp	1%
Adenovirus-based	7%	Don't know	8%



Unaided Recall of Vaccine MOAs (2/2)

Some physicians express that they expect certain MOAs to yield more durable responses than others, with a few being critical of the use of mRNA technology.

Q1

Please list the mechanisms of action (MoAs) for the different COVID-19 vaccines of which you are aware?

"I expect different levels of efficacy based off which MOAs are being utilized.

Use of vector-based vaccines, which are live viruses modified to produce pathogen antigen(s), may be a powerful approach to stimulating the immune system by producing both a T-cell and B-cell response. mRNA based vaccines, however, are unproven even if they are scientifically sound. Also, single antigen, protein-based vaccines are usually not very effective against viral pathogens, and DNA vaccines have had limited success."

- Physician from GA, age 52



Competitive Landscape - *Milestones*

Moderna is overwhelmingly viewed as the vaccine that will be first approved, manufactured, and accessible in the US.

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Q2 Please choose which vaccine		Which vaccine do you think will get approved the soonest?	For which vaccine do you think manufacturing will be ramped up the fastest?	Which vaccine do you think will be available for public access in the US the soonest?
is the best answer to	Moderna	45%	29%	41%
each question.	AstraZeneca + University of Oxford	19%	15%	13%
	Pfizer + BioNTech	5%	10%	7%
Note	Merck	2%	11%	5%
Vaccines from Vaxart and CSL/	Johnson & Johnson	3%	10%	6%
Queensland were also listed	Sanofi	6%	5%	5%
but received	Inovio	4%	3%	4%
<1% of responses.	Novavax	3%	1%	0%
	Don't know	12%	15%	18%

Competitive Landscape - *Promise* (1/4)

Despite winning across all development metrics by a large degree, Moderna's vaccine is only slightly ahead of AstraZeneca's vaccine when being measured by perceptions of efficacy and promise.

Q2 Please choose which vaccine		prevent a patient from getting COVID-19?	have the strongest efficacy across the most people	provide herd immunity	allow society to returr to normal
is the best answer to	Moderna	15%	12%	17%	20%
each question.	AstraZeneca + University of Oxford	14%	12%	12%	12%
Note	Pfizer + BioNTech	4%	6%	5%	5%
	Merck	5%	6%	8%	3%
Vaccines from Vaxart and CSL/	Johnson & Johnson	4%	5%	3%	5%
Queensland	Sanofi	5%	3%	3%	4%
were also listed but received	Inovio	2%	4%	2%	2%
<1% of responses.	Novavax	1%	1%	2%	1%
	Don't know	49%	51%	48%	48%

Competitive Landscape - Promise (2/4)

Moderna is seen as most promising because production is likely to be fast, scalable, and agile, several clinical trials are well underway, and immunological design appears to be robust.

Q2a	Open-ended r	esponses
For the vaccine you think is the most promising to prevent a patient from getting COVID-19, why do you feel this way (even if not listed)?	Moderna	 "High levels of neutralizing antibodies demonstrated in a novel mechanism vaccine that can be ramped up in production easily and modified as we go along if needed." – Physician from GA, age 44 "Several controlled trials going on at the same time. They are systemic trials and are all evidence based." – Physician, CA, age 42 "It is highly scalable, manufacturing is rapid, and there is significant design flexibility." – Physician, CA, age 54 "Should be he most immunologically robust vaccine and least susceptible to viral mutations (i.e., D614, G614)." – Physician, TX, age 67
Note	AstraZeneca + University of Oxford	 "Should be immunogenic with an appropriate target to be effective if deemed safe" – Physician, TN, age 52 "Leading for mass production It has the backing of both the academic and a pharmaceutical giant." – Physician, MI, age 32 "It's all a guess at this point, but based on company's track record and data from Phase I/II trials." – Physician, CA, age 48
Vaccines from Vaxart and CSL/ Queensland were also listed but received <1% of responses.	Pfizer + BioNTech	 <i>"Pfizer, BioNtech, and FosunPharma a combination of three companies with good funding and manufacturing capabilities."</i> – Physician, TX, age 47 <i>"Well known companies with a long safety record, extensive research and development infrastructure, and a history of excellent other vaccines."</i> – Physician, NH, age 58



Competitive Landscape - Promise (3/4)

Although some physicians choose their pick for most promising vaccine based on the data or MOA they find most encouraging, many also choose based on company reputation and resources.

Q2a	Open-ended r	responses				
For the vaccine you think is the most	Merck	o "The modified measles vaccine will deliver the strongest immune response." - Physician from NY, age 58				
promising to prevent a patient from getting COVID-19, why do you feel this	Johnson & Johnson	o "Based on preliminary data Johnson and Johnson seems to offer the most hope to anyone." - Physician from NJ, age 41				
way (even if not listed)?	Sanofi	 "Reliable company with excellent vaccines for flu, pneumococcal." - Physician from RI, age 46 "It is using new technology and as long it's immunogenic without side effects should be good. GSK is also a very powerful that may work well with the antigen from Sanofi to stimulate a high long lasting response." - Physician from MI, age 70 				
Note	Inovio	• "I find the evidence for this one to be the most promising." - Physician in TN, age 52				
Vaccines from Vaxart	Novavax	o "Mechanism of action could create robust immunity." - Physician in NJ, age 64				
and CSL/ Queensland were also listed but received <1% of responses.	Other	 <i>"Sorrento's passive immunity-neutralizing antibody will be much more safe and efficacious than active immunization."</i> - Physician in NJ, age 65 <i>"The evidence is not available yet, but the candidate from Sinovac in China showed the most promising results on their animal model:</i> good levels of neutralizing antibodies, low levels of antibody dependent enhancement, and low detection of viral RNA on tissue after challenge with the virus." - Physician in AZ, age 44 				



Competitive Landscape - Promise (4/4)

Physicians who opted out of voting for a most promising vaccine cite that it is still early days, that many distribution questions are still unanswered, and that it is still unclear if conferring sustained immunity to COVID-19 will even be possible.

Q2

Please choose which vaccine is the best answer to each question. 66

"I think these vaccines will struggle with development of protective immunity over time. I think they will get approved by the FDA and I think they will generate some antibody response in people, but I don't think the antibody response will last more than a few months and the protective benefit will not last from season to season, so these vaccines

will be required at least annually."

- Physician from MI, age 45

have demonstrated superiority over another. **Development is** still in its infancy and clinical trials are only starting now. Also very few are constant changes in the spike protein through the natural process of mutation."

"I don't think any of the vaccines

66 /

"Some preliminary results look promising, however, **many things remain to be seen** how quickly and broadly can we distribute a vaccine with all the interruptions in global supply chain? How durable will the immunity be? How many people will agree to take it?"

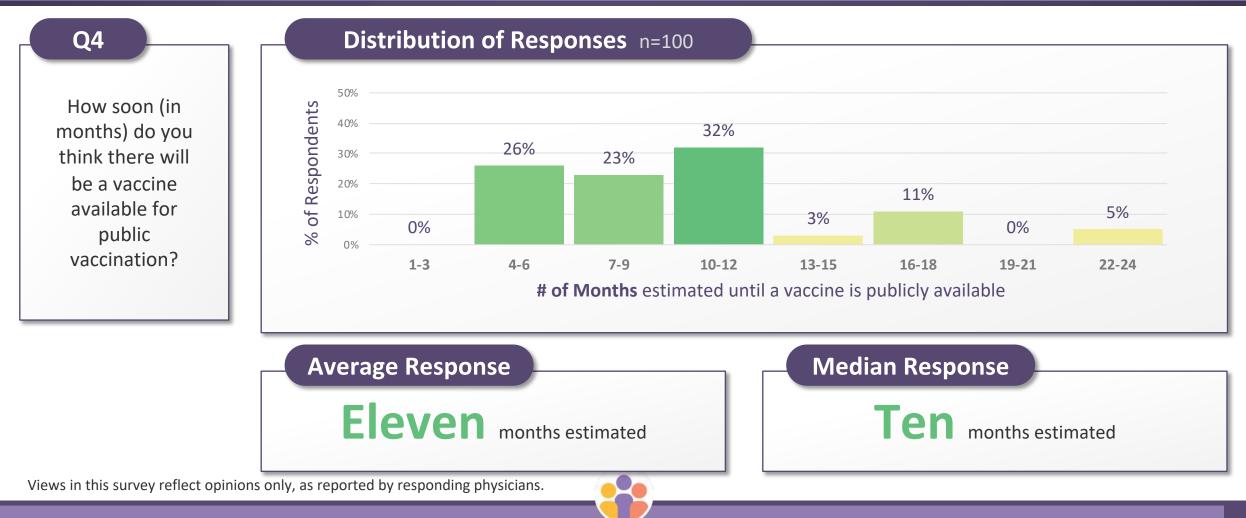
- Physician from TX, age 56

- Physician from CO, age 35



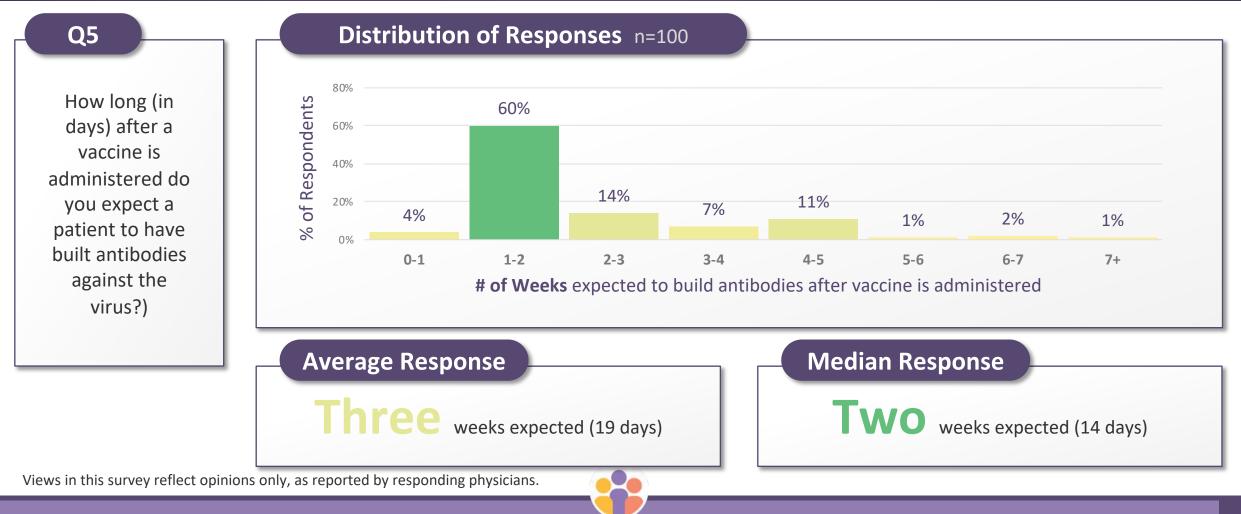
Time Projections for Vaccine Availability

Physicians estimate an average of eleven months until a vaccine is publicly available; over 80% expect a vaccine within a year.



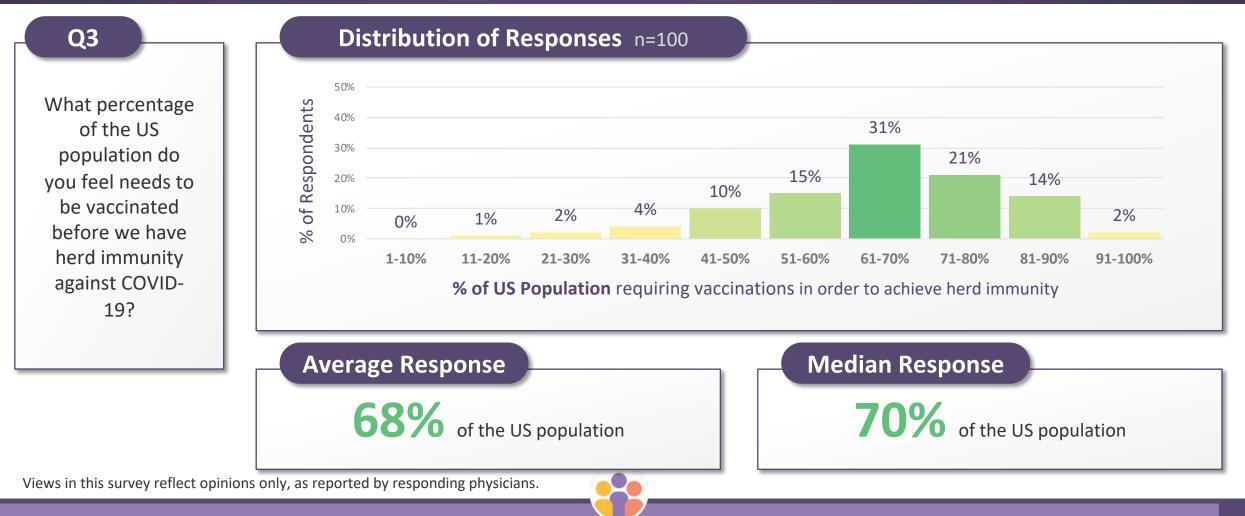
Estimated Time for Vaccine Antibody Production

Most physicians (60%) expect that immunity within a patient will happen within 1-2 weeks of being vaccinated; 36% believe it will take longer.



Threshold for Herd Immunity in the US

On average, respondents predict that 68% of the US population will need to be inoculated in order to achieve herd immunity. Two-thirds believe herd immunity will require that >60% are vaccinated.



Mass Vaccination Execution (1/3)

Infectious disease specialists expect mass vaccination to take place via a combination of efforts from public and private sectors, with a majority of distribution happening at public health centers and private clinics.

Q7

Please describe how you expect mass vaccinations will take place once a vaccine is available.

Responses Unaided Open-End	% n=100	Cont.	% n=100
Distribution channels	-	Distribution system prioritization	-
Health departments / Public health centers	32%	Based on risk	13%
Private clinics	23%	Based on age	7%
Pharmacies / drug stores	19%	Healthcare workers prioritized	7%
Doctor's offices	18%	Essential workers prioritized	6%
Hospitals	13%	First come first serve	1%
Drive-through clinics	9%	Coordinated by CDC / government	13%
Mass vaccination pop-up sites	8%	Duplicating or using flu-vaccine infrastructure	9%
Schools	5%	Required by gov., schools, or employers	3%
Mobile clinics/ vaccination drives	4%	Facilitated by pharma companies	1%
Places of employment	3%		1/0
Supermarkets	2%		

Mass Vaccination Execution (2/3)

Generally physicians foresee that vaccines will be distributed using a tiered approach, with widespread availability across public and private clinics, pharmacies, doctor's offices, hospitals, and schools.

Q7

Please describe how you expect mass vaccinations will take place once a vaccine is available.

55

"I see these being made easily available at physician offices, pharmacies, and health departments. Having them available at school and having **health departments reach out to underserved communities** will also be helpful."

 Physician from VA, age 40

66

"Will likely be available across multiple sites hospitals, physician offices, pharmacies, and health departments. **Will be** distributed in tiered groups - first to healthcare workers, then the elderly and immunocompromised, then other adults, and finally children."

 Physician from IL, age 52

"NIAID should choose what vaccine to use from the potential candidates. Once this vaccine available, high risk populations should be vaccinated first, followed by healthcare workers, essential workers and the elderly. Then steps should be put into place to mass administer the vaccine to

 Physician from AZ, age 44

other populations."

56

"Vaccinations should be administered in all possible sites. Drivethrough testing and popup **testing sites and clinics that have already been established should rollover** to vaccination or additional sites should be set up using a similar model."

 Physician from GA, age 52

Mass Vaccination Execution (3/3)

Some physicians express skepticism with the feasibility of mass vaccinations, with most concerns questioning the capacity of insurers and the government to support and finance the endeavor.

Q7

Please describe how you expect mass vaccinations will take place once a vaccine is available.

56

"I imagine everyone will rush primary and urgent care offices, as well as the ERs. Mass vaccination clinics sound nice, but in the US, insurance companies will create too many financial barriers to do this feasibly."

 Physician from CO, age 35

through private clinics and public health sites as well as outreach to nursing homes and other high-risk settings with people who have limited mobility. But **I** doubt that our current government is capable of implementing these

efforts correctly."

- Physician from CA,

"Will be administered

"Injections may work with drive-up sites but if other modalities are made available like self-injection, shelf-stable, or patch, mass vaccination will be more feasible. This will be a **serious challenge if a new vaccine has to be developed yearly like the flu** - the compliance will go down again."

 Physician from CA, age 51

56

"I think **there will be tremendous demand that will exceed capacity**. Public and private sectors will need to collaborate on outreach and education, and may have to coordinate the equivalent of "Sabin Sundays" akin to mass oral polio immunization."

 Physician from TX, age 67

Populations for Prioritized Vaccinations (1/2)

Close to three-quarters believe that healthcare workers should be among the top priority population if vaccine distribution is to be tiered, with the most vulnerable populations also ranking highly.

Q8	Population Segmentation	% Ranking in Top Three n=100	Median Ranking n=100
	Healthcare workers	73%	1 st
Please order the populations	Patients with chronic respiratory diseases (e.g. COPD, asthma)	57%	3 rd
below based on priority to	Patients with other common COVID-19 vulnerable conditions (e.g. diabetes, cardiovascular disease, hypertension)	54%	3 rd
receive vaccines	Healthy people ages 80+	47%	4 th
from first to last.	Patients with cancer	27%	5 th
	Healthy people ages 60-79	25%	6 th
	Patients with obesity	7%	6 th
	Healthy people ages 40-59	2%	8 th
	Healthy people ages 20-39	5%	9 th
	Healthy people ages 1-19	3%	10 th

Populations for Prioritized Vaccinations (1/2)

While healthcare workers and vulnerable/elderly populations are seen as obvious recipients of early vaccines to many, a handful write in that they find that the young and healthy should be among the first to be vaccinated since they are most responsible for asymptomatic spread.

Q8

Please order the populations below based on priority to receive vaccines from first to last. Please explain your thinking.

- U b

Healthcare Workers "HCWs are our front line- without them, or enough of them, we all suffer. They need to be protected first." – NJ, age 38

"Immunize the immunizers first. Some chronic patients (ie. cancer) may not even respond to a vaccine, so they will have to be protected by having other caregivers be immunized." – MI, age 45

"PPE supplies are imitated and HCWs are subjected to increased exposure through their job. They **don't have the option to shelter in place.**" – CA, age 33

"HCWs are at **highest risk for spread to vulnerable populations** (SNFs, inpatients, etc.) and acquisition as they are taking care of COVID patients." – CA, age 36

Older, Vulnerable People

"The most **vulnerable populations will need to be vaccinated earliest.** In our experience this has been obese, DM, HTN, COPD, and cancer patients. After this group, vaccinating healthy individuals aged 60-79 should get us close to herd immunity." – NY, age 58

"Focus should be on overall population mitigation starting with older, vulnerable groups with reasonable functional status and quality of life, followed by individuals 55+ and **working down the age ladder**." – GA, age 44

"Those at most risk need to be vaccinated first – for us that group starts with **transplant recipients and Cancer patients**." – NJ, age 65



Young, Healthy People

"Spread has occurred mostly in younger healthy people so targeting them should cut down on spread of virus quicker." – PA, age 42

"Get healthy individuals done first to help with herd immunity. **Need to reduce healthy asymptomatic transmission**." – AZ, age 36

"It's difficult to assess the impact of vaccine on people with underlying conditions. Therefore its **important to target those that are likely transmitters first**." – NJ, age 52

"Preference should not just go to high risk groups but also **those most likely to have a good immune response to the vaccine.**" – TX, age 56



Return to Pre-Pandemic Practices

Physicians have polarizing opinions regarding their facilities returning to normal volumes of patients and procedures. While a third believe that this can happen immediately, a third also find that this should not take place until 2021 or later pending a vaccine/immunity.

Q6 Assuming herd immunity is achieved, please		now/ have already started	in 30 days	in 60 days	in 90 days	by 2021 at the earliest	only once a vaccine is publicly available	only once herd immunity is reached (due to vaccination level)	never again regardless of vaccination	Don't Know
neck the propriate ponses for en you're	Advising hospitals to be per- forming the same number of , or more, elective surgeries and procedures than pre-pandemic	34%	12%	9%	8%	18%	8%	7%	0%	4%
considering doing each of the following activities.	Seeing the same patient load as before the pandemic started	33%	11%	4%	7%	20%	10%	9%	1%	5%
	Visiting with sales reps	12%	5%	7%	8%	19%	10%	10%	14%	15%
	Advising my hospital to allow visitors for patients in a manner similar to how they did pre-pandemic	6%	9%	3%	8%	16%	19%	27%	6%	6%
	No longer feeling compelled to wear a mask in public or practice social distance	1%	2%	2%	2%	20%	15%	43%	5%	10%

Return to Pre-Pandemic Practices (2/2)

Despite many physicians reporting that they expect to ramp up pre-COVID practices, many write-in that they believe maintaining stringent precautions is crucial while vaccines are still in development.

Q6

Please help us understand what is influencing your thinking regarding when you're considering doing each of the activities.

56

"COVID infection rates are highly variable and are dependent on seasonal variation and compliance with masks/social distancing. Any changes in human behavior can alter infection rate. **Until an effective vaccine has been administered to 70% of the population, medical practice and daily life will be impacted.**"

 Physician from NY, age 58 "Hospitals and medical offices have a very important role in infection prevention, and there would **undoubtedly be more infections if we collectively return to practice as things were prior to the pandemic.** A much greater degree of population protection is needed."

- Physician from MI,

"Time will tell you how well something works so not in a rush currently to **take one step forward and sprint a 200-meter race backwards.** I am skeptical that any of these problems will be resolved soon, in fact I think we are backsliding in terms of progress. I expect that abandonment of infection control protocols is at least

1 year away at this point."

- Physician from TX,

56

"It is clear that in an epidemiologic sense the pandemic in the US is not abating. Today (6/26) the total number of new cases in the US is the highest ever. This is not due to increased testing, as some politicians would have us believe, but because the pandemic is spreading at a threatening rate in many states. In this context **it will not be** reasonable for us to let down our quard for many months."

 Physician from IA, age 71

Anticipated Policy Changes Post-Vaccine (1/2)

43% expect that most restrictions will be eased once vaccines are made available—17% specify that they expect visitation restrictions to be eliminated or relaxed.

Q9a

Considering hospital policies have changed to address the COVID-19 pandemic How might these policies change once a vaccine is available to the general public (e.g., no visitors, COVID-only zones, telescreening)?

Responses Unaided Open-End	% Mentioning n=100
Widespread easing of restrictions/opening back up	43%
Visitors will be allowed	17%
Policies will stay the same until herd immunity threshold	14%
Telehealth will remain	10%
COVID-only zones will remain	7%
Access limited to vaccinated persons only/use of vaccine "passports"	6%
Masks will remain	4%
Screening and temperature checks will remain	3%
Mandatory vaccines for healthcare workers	2%
Less telehealth	2%
Less stringent PPE	2%



Expected Continued Practices Post-Vaccine

Twenty-eight percent believe masking will still be prevalent after a vaccine is made available, and 20% also find that telehealth practices will continue at comparable volumes.

Q9b

Considering hospital policies have changed to address the COVID-19 pandemic, what, if any, policy changes that were made to address the COVID-19 crisis do you think should remain in place once a vaccine is available to the general public?

Responses Unaided Open-End	% Mentioning n=100
Masking	28%
Telehealth	20%
Hand hygiene	15%
Screening/tele-screening	13%
Social distancing/6-ft apart	12%
Visitation restrictions	10%
COVID-only zones	3%
Testing	2%
Investment in public health	2%





For more informatio

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